

FLORA  
OF  
THE UPPER GANGETIC PLAIN,  
AND OF THE  
ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

BY  
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NORTHERN INDIA.

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PART I.

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NYCTAGINACEÆ to CERATOPHYLLACEÆ.

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# Flora of the Upper Gangetic Plain

and of the adjacent

## Sivalik and Sub-Himalayan Tracts.

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### LXXXIX.—NYCTAGINACEÆ.

Herbs, shrubs or trees. *Leaves* usually opposite, entire, exstipulate. *Flowers* 2-(rarely 1-) sexual, regular, sometimes dimorphous; inflorescence various; bracts often forming an involucre, free or connate. *Perianth* small, monophyllous, usually petaloid, the tube persistent, enveloping the fruit; limb 3-5-lobed, persistent or deciduous, lobes plicate in bud. *Stamens* 1-30, hypogynous, sometimes unilateral; filaments usually unequal, inflexed in bud; anthers included or exserted, dorsifixed, didymous. *Ovary* free, 1-celled; style filiform, involute in bud, stigma simple or multifid; ovule solitary, basal, erect. *Fruit* membranous, indehiscent, enclosed in the hardened perianth-tube. *Seed* erect, testa adherent, albumen soft or floury, embryo curved or straight and with folded cotyledons, radicle inferior.—Species about 220, chiefly in Trop. America.

**BOERHAAVIA**, Linn. ; Fl. Brit. Ind. iv, 708.

Erect or diffuse herbs, often with divaricate branches. *Leaves* opposite, often unequally paired. *Flowers* small, arranged in panicles umbels or heads, pedicels jointed; bracteoles minute, often deciduous, rarely whorled and involucre. *Perianth-tube*

long or short, ovoid below; limb funnel-shaped, 5-lobed. *Stamens* 1-5, exserted. *Ovary* oblique, stipitate, stigma peltate. *Fruit* small, 5-ribbed or -angled, viscidly glandular. *Embryo* hooked; cotyledons broad and thin, the outer the larger, enclosing soft scanty albumen.—Species about 30, in tropical and sub-tropical regions of both hemispheres.

Fruit glandular on the ribs, not at the crown:—

Leaves of each pair very unequal, entire or subundulate; flowers subcapitate, pink or purple . . . . . 1. *B. diffusa*.

Leaves of each pair nearly equal, repand-sinuate; flowers in umbels, long-pedicelled, pink . . . . . 2. *B. repanda*.

Fruit with large semiglobose glands round the crown; flowers in whorls, usually white; leaves obtuse . . . . . 3. *B. verticillata*.

1. *B. diffusa*, Linn. *Sp. Pl.* 3; Royle *Ill.* 312; Watt *E. D.*; Cooke *Fl. Bomb.* ii, 480. *B. repens*, Linn.; F. B. I. iv, 709; Collett *Fl. Siml.* 410, fig. 131; Prain *Beng. Pl.* 862. *B. repens*, vars. *diffusa* and *procumbens*, F. B. I. l. c. and Prain l. c. *B. procumbens*, Rozb. *Fl. Ind.* i, 146.

A diffusely branched herb; root stout, fusiform, rootstock woody. *Stems* 2-3 ft. long, slender, prostrate or ascending, swollen at the nodes, minutely hairy and sometimes viscid or subglabrous, often tinged with purple. *Leaves* rather thick, arranged in unequal pairs at each node,  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, ovate oblong or sub-orbicular, green and glabrous above, usually white beneath; base rounded or subcordate, margins subundulate, often pink; petioles about as long as the blade. *Flowers* minute, subcapitate, 4-10 together in small bracteolate umbels forming slender long-stalked axillary and terminal panicles; bracteoles lanceolate, acute. *Perianth*  $\frac{1}{2}$  in. long; tube glandular-hairy; limb red, funnel-shaped, with 5 narrow vertical bands outside. *Stamens* 2 or 3, slightly exserted. *Fruit*  $\frac{1}{2}$  in. long, clavate, rounded, viscidly glandular on the 5 broad blunt ribs.

An abundant weed within the area of this flora, and very variable in habit and pubescence according to soil and situation. **DISTRIB.:** Throughout India, ascending to 7,000 ft. in the warm valleys of the

Himalaya; also in Ceylon and the Malay Peninsula; extending to China, Africa, America and the Islands of the Pacific. The root is used medicinally and the leaves are eaten as a pot-herb. The viscid perianth-tube containing the fruit is easily detached and thus becomes widely distributed by animals.

**2. *B. repanda*, Willd. *Sp. Pl.* i, 22; Royle *Ill.* 312; F. B. I. iv, 709; *Prair. Beng. Pl.* 863; *Cooke Fl. Bomb.* ii, 480.**

A diffuse subscandent herb, glabrous or pubescent; branches 3-6 ft. long, cylindric, glabrous or nearly so. *Leaves* in nearly equal pairs, 1-3 in. long, triangular-ovate, acute or acuminate, repand-sinuate, glabrous above, pubescent beneath, base cordate or truncate; petioles slender,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Umbels* 3-8-fld., on long slender peduncles; pedicels filiform,  $\frac{1}{2}$ -1 in. long; bracteoles lanceolate, acute. *Perianth* pink, about  $\frac{3}{4}$  in. long, lobes notched. *Stamens* 4 or 5, much exserted. *Fruit*  $\frac{1}{2}$  in. long, clavate, obscurely ribbed, rough with glandular projections.

Plentiful within the area, and often found climbing amongst bushes.

**DISTRIB.:** Throughout the W. Peninsula; also in Ceylon, Baluchistan and Burma, extending to China and Australia.

**3. *B. verticillata*, Poir. *Encycl. Méthod.* v. 56; F. B. I. iv, 710; *Cooke Fl. Bomb.* ii, 480. Vern. *Satha* (Merwára).**

A decumbent or climbing annual or perennial herb; branches long, pale, terete, glabrous. *Leaves* thick, 1 $\frac{1}{2}$ -2 $\frac{1}{2}$  in. long, often broader than long, broadly ovate or suborbicular, obtuse, mucronate, usually glabrous, margins sinuate, base usually cordate, petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. *Flowers* in long-peduncled racemes, arranged in distant few-flowered whorls on a slender rhachis; bracteoles small, ovate-oblong, acute, deciduous, pedicels slender. *Perianth* usually white,  $\frac{1}{2}$  in. long, lower portion constricted above the ovule, limb funnel-shaped, lobes 2-fld. *Stamens* slightly exserted. *Fruit*  $\frac{1}{2}$  in. long, clavate, with large semi-globose glands round the crown.

Merwara in Rajputana (Duthie). **DISTRIB.:** Punjab, Sind and in the drier parts of the W. Peninsula; also in Afghanistan and Baluchistan, extending westwards to Syria and Trop. Africa.

The following plants belonging to genera introduced from South America, are much grown in the gardens of North India:—

**MIRABILIS JALAPA L.** (Marvel of Peru)—A tall much-branched perennial herb, bearing a profusion of yellow white crimson or variegated flowers. It is cultivated in all parts of India, and is sometimes

met with as an escape. The structure of the flowers is very similar to that of *Boerhaavia*. The leaves and flowers are used in native medicine under the name of *gul-abbas*.

*BOUGAINVILLEA* *SPECTABILIS*, Willd. A robust thorny extensively climbing shrub with softly pubescent branches and leaves. It bears masses of flowers during the hot season, and at that time becomes a very beautiful and conspicuous object by reason of its large and brilliant purple-coloured bracts. A very handsome variety known as *B. lateritia*, with crimson or brick-red bracts, was introduced into India about 30 years ago, and from the two original plants, now at Saharanpur, the gardens in other parts of India have been supplied.

*B. GLABRA*, Choisy is also largely cultivated in gardens. It is less robust as a climber, and almost devoid of thorns; the branches and leaves are glabrous and the bracts are magenta-coloured. It flowers more or less throughout the year.

## XC.—AMARANTACEÆ.

Herbs, rarely undershrubs, erect or with climbing branches. *Leaves* opposite or alternate, exstipulate. *Flowers* small, usually 2-sexual, (rarely diœcious or polygamous), arranged in terminal simple or paniced spikes cymes or clusters, the outer flowers of a cluster sometimes deformed; bracts hyaline or scarious, never leaf-like bracteoles 2, scarious. *Perianth* dry, persistent, usually of 5 free or slightly connate hyaline or scarious segments, imbricate in bud. *Stamens* 1-5, opposite the perianth-segments; filaments usually connate below or united with intervening membranous staminodes in a hypogynous cup; anthers 1-or-2-celled. *Ovary* 1-celled; style sometimes simple or obsolete and with a capitellate or small stigma, or 2-3-fid. with acute stigmas, or styles 2-3, erect or recurved and stigmatic on the lower face; ovules 1 or more, amphitropous, erect or suspended from free basal funicles. *Fruit* a membranous utricle, rarely a circumscissile or irregularly bursting capsule, very rarely a berry enclosed in or supported by the persistent perianth. *Seed* inverted or erect, orbicular ovate or reniform, compressed, testa crustaceous; embryo horseshoe-shaped or annular, surrounding the floury albumen.—Species about 500.

inhabiting tropical and sub-tropical regions. The family is closely allied to the *Chenopodiaceæ*, differing chiefly in habit.

Leaves alternate ; staminodes none :—

Ovary 2-many-ovuled :—

A shrub with scarlet berries . . . . . 1. DEERINGIA.

Herbs with circumscissile capsules . . . . . 2. CELOSIA.

Ovary 1-ovuled ; ovule erect :—

Flowers 2-sexual, in spikes ; fruit a crustaceous nut . . . . . 3. DIGERA.

Flowers monœcious or polygamous : fruit an indehiscent or circumscissile utricle . . . . . 4. AMARANTUS.

Leaves alternate or fascicled or with opposite and alternate leaves mixed ; stamens with interposed staminodes . . . . . 5. ERUA.

Leaves all opposite (not fascicled) ; stamens with or without interposed staminodes :—

Anthers 2-celled :—

Flowers all perfect, in spikes :—

Stamens 2 ; staminodes none . . . . . 6. NOTHOSÆRVA.

Stamens 5, with interposed staminodes . . . . . 7. ACHYRANTHES.

Flowers fascicled, each fascicle containing one perfect flower and several sterile ones the perianth-segments of which become converted into spreading hooked bristles ; staminodes none . . . . . 8. PUPALIA.

Anthers 1-celled . . . . . 9. ALTERNATHERA.

### 1. DEERINGIA, R. Br. ; Fl. Brit. Ind. iv, 714.

Rambling or climbing undershrubs. Leaves alternate, petioled. Flowers small, in simple or paniced spikes, 2- sexual or polygamodiceous ; bracts and bracteoles scarious. Perianth-segments 5, sepaline, free and equal or nearly so, membranous or herbaceous, spreading in fruit. Stamens 4 or 5, connate below in a hypogynous cup ; anthers broadly oblong, 2-celled. Ovary ovoid or subglobose, sessile or stipitate ; styles 2 or 4, subulate, connate below, uniformly papillose throughout, or small sessile and capitellate ;

ovules few or many, on long funicles. *Fruit* a small globose berry seated on the persistent spreading perianth. *Seeds* few or many, reniform, compressed; testa black, shining, aril none; embryo annular, surrounding the floury albumen; cotyledons linear, radicle descending. Species 5-6, in Asia, Australia and the Pacific Islands, and one in Madagascar.

**D. celosioides**, *R. Br. Prod.* 413; *Roxb. Fl. Ind. i.* 682; *Royle III.* 320; *F. B. I. iv.* 714; *Kanjilal Gor. Fl. ed. 2.* 323; *Gamble Man.* 550; *Collett Fl. Siml.* 412; *Prain Beng. Pls* 866; *Brand. Ind. Trees* 518. *Cladostachys frutescens*, *Don Prod.* 76 (excl. syn.) Vern. *Latman* (Hind.), *chundri* (Dehra Dun).

A climbing shrub with long slender arching striate branches; bark thin, rough, dark-grey. *Leaves* 2-4 in. long, ovate or broadly lanceolate, acuminate, entire; base rounded or acute, rarely cordate, petiole  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* small, pale yellowish-green, shortly pedicelled, arranged in simple or branching racemes 4-10 in. long and forming terminal panicles, bracts acute. *Styles* usually 3. Berry globose,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., supported by the persistent spreading perianth-segments, scarlet when ripe. *Seeds* usually 3.

Found in hedges and on the outskirts of forests in Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during Sep. and Oct., and in the cold season the panicles of scarlet berries render it a conspicuous object. **DISTRIB.**: Subtrop. Himalaya from the Sutlej to Bhutan, up to 5,000 ft.; also in Chota Nagpur, Assam, the Khasia Hills, Bengal and Upper Burma; extending to the Malay Islands, China and Australia. Kanjilal states that the juice of the fruit can be used as a substitute for red ink.

## 2. CELOSIA, Linn.; Fl. Brit. Ind. iv, 714.

Usually annual herbs, the stems often woody below. *Leaves* alternate, usually petioled. *Flowers* 2-sexual, in dense terminal and axillary spikes, sessile or shortly pedicelled, white or coloured; bracts and bracteoles scarious, shining. *Perianth-segments* 5, connate below, scarious, erect in fruit. *Stamens* 5, filaments united below in a membranous cup; anthers 2-celled; staminodes none. *Ovary* 1-celled, containing 2 or more ovules attached to long funicles; styles short or long or none, sometimes-elongating in fruit; stigmas simple or 2-3, subulate. *Fruit* a circumscissile

capsule, membranous or sometimes corky or coriaceous. *Seeds* 2 or more, erect, lenticular, testa crustaceous, black and often shining; embryo annular, surrounding the fleshy albumen; cotyledons linear, radicle descending or ascending. Species about 35, in Trop. Asia, Africa and America.

*C. argentea*, Linn. *Sp. Pl.* 205; Roxb. *Fl. Ind.* i, 678; Royle *Ill.* 320; F. B. I. iv, 714; Watt. *E. D.*; Collett *Fl. Siml.* 412; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 485. *C. margaritacea*, Linn.; Don *Prod.* 76.—Vern. *Sajed murga-ka-phul*.

An erect glabrous annual, 1-3 ft. high. *Stem* stout or slender, simple or branching. *Leaves* 1-4 in. long, linear or narrowly lanceolate, rarely ovate, tapering into a short petiole or sessile. *Flowers* pink when young, becoming white and glistening, closely imbricate and forming blunt or acuminate cylindric terminal spikes 1-6 in. long and sometimes branching at the apex; bracteoles shorter than the perianth, linear-lanceolate. *Perianth*  $\frac{1}{2}$  in. or more; segments linear-lanceolate, acute. *Capsule*  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, ellipsoid. *Seeds* 4-8, compressed, subreniform,  $\frac{1}{8}$  in. in diam.

Abundant within the area, especially on cultivated ground. Flowers during the end of rainy season. *DISTRIB.*: Throughout India, cultivated or as an escape, ascending to 5,000 ft. on the Himalaya; also in Ceylon, and as an introduction in most tropical countries. Its native country is not known for certain. The plant is used as a pot-herb in times of scarcity and the seeds are employed medicinally.

*C. CRISTATA*, Linn.; Roxb. *Fl. Ind.* i, 679; Don *Prod.* 76; Royle *Ill.* 320; F. B. I. iv, 715; Watt. *E. D.*; Prain *Beng. Pl.* 867; Cooke *Fl. Bomb.* ii, 486. *C. cernua*, Roxb. l. c. 680. Vern. *Murgha-ka-phul* (Cockscomb).

Closely allied to the proceeding, but usually a taller plant and with broader leaves and much smaller flowers. It is cultivated in gardens as an ornamental plant throughout India and up to 5,000 ft. on the Himalaya. It has pink crimson or yellow flowers borne on the usually fasciated and crest-like divisions of the spikes. It is often found as an escape, but never truly wild.

### 3. DIGERA, Forsk.; *Fl. Brit. Ind.* iv, 717.

An annual herb; branches angular. *Leaves* alternate, entire, petioled. *Flowers* in axillary peduncled spikes, ternate, the 2

outer reduced to crested scales, the central one perfect. *Perianth* sub-membranous, calycine segments 5, slightly connate below, oblong, erect, the 2 outer larger. *Stamens* 5, hypogynous, filaments free, filiform; anthers 2-celled; staminodes none. *Ovary* 1-celled, oblong, compressed, truncate; style filiform; stigmas 2, recurved; ovule solitary, erect. *Fruit* a subglobose crustaceous nut, included in the perianth. *Seed* subglobose, erect; testa thin, crustaceous, brown, adhering to the albumen, embryo annular, cotyledons linear, radicle descending. A single species, occurring in India and Ceylon, and extending to Afghanistan, Baluchistan, Arabia and N. Africa.

**D. arvensis**, Forsk. *Fl. Egypt-Arab.* 65; Royle *Ill.* 320; F. B. I. iv, 717; Watt *E. D.*; Prain *Beng. Pl.* 868; Cooke *Fl. Bomb.* ii, 487. *Achyranthes alternifolia*, Roxb. *Fl. Ind.* i, 674.

A slender annual weed of cultivation, or sometimes becoming perennial and with spreading prostrate branches. *Leaves* glabrous, very variable,  $\frac{1}{2}$ -3 in. long, ovate or elliptic, acute or rounded at the apex, base rounded or cuneate, margins often tinged with red; petioles slender,  $\frac{1}{2}$ -1 in. long. *Flowers* sessile, forming lax axillary peduncled spikes 1-5 in. long; bracts and bracteoles shorter than the perianth, ovate-lanceolate, acute, submembranous, persistent. *Perianth* pink,  $\frac{1}{4}$  in. long; segments ovate-oblong, acute. *Fruit*  $\frac{1}{8}$ - $\frac{1}{10}$  in. in diam., slightly compressed and margined, muriculate.

Common and widely distributed over the area of this flora, flowering usually after the rains are over. **DISTRIB.**: Plains of N. India from the Punjab to Bengal, and in Western C. and S. India; extending to Ceylon, Afghanistan, Baluchistan, Arabia and N. Africa. The leaves are often used as a pot-herb.

#### 4. AMARANTUS, Linn.; Fl. Brit. Ind. iv, 718.

Erect or decumbent annual herbs. *Leaves* alternate. *Flowers* small, monœcious or polygamous, arranged in axillary clusters or in dense terminal and axillary spikes or panicles; bracts herbaceous, often persistent; bracteoles 2. **MALE fl.**: *Perianth* of 5 (rarely, 1-3) membranous ovate-lanceolate segments. *Stamens* 5 (rarely 1-3); filaments free, subulate or filiform; anthers 2-celled; staminodes none. **FEM. fl.** *Perianth-segments* oblong or spatulate, erect in fruit. *Ovary* ovoid, compressed; style short or none, stigmas 2 or



3; ovule solitary, subsessile, erect. *Fruit* an orbicular or ovoid compressed utricle, or a circumscissile membranous or coriaceous capsule, entire or 2-3-toothed at the apex. *Seed* erect, orbicular, compressed; testa crustaceous; embryo annular, enclosing the floury albumen, cotyledons linear, radicle inferior. The number of species cannot be definitely determined, as a large proportion of those described as such are known only in cultivation. Many of them are widely distributed in tropical and sub trop. regions of the world either cultivated or as weeds.

Bracteoles awned or setaceous, equalling or exceeding the sepals; fruit dehiscent, circumscissile :—

Stamens 5; Sepals 5 :—

Leaf-axils with 5 spines; stems terete; leaves ovate or oblong, obtuse; bracts setaceous; flowers in dense or lax spikes . 1. *A. spinosus*.

Leaf-axils not spinous; stems striate; leaves elliptic or ovate-lanceolate; bracts acicular; spikes thyrsoïd :—

Leaves acute or acuminate; bracts recurved, much exceeding the oblong-lanceolate acuminate sepals . 2. *A. paniculatus*.

Leaves obtuse, rarely acute; bracts hardly recurved, not greatly exceeding the obovate mucronate sepals . 3. *A. caudatus*.

Stamens 3; sepals 3; leaves obtuse or emarginate :—

Stems branching above the middle, yielding under cultivation only one crop annually . 4. *A. gangeticus*.

Stems branching near the base, yielding several crops annually . *A. gangeticus* var. *tristis*.

Bracteoles acute, hardly awned, shorter than the sepals; fruit usually indehiscent; leaves obtuse, rounded or notched :—

Stamens 3; sepals 3 :—

Fruit with an acute apex, indehiscent, rugose; clusters axillary and in terminal paniced slender spikes . 5. *A. viridis*.

Fruit blunt at the apex :—

Fruit orbicular or broadly ovate, indehiscent, membranous :—

Procumbent ; leaves small, 2-lobed ; clusters all axillary . . . . . 6. *A. Blitum*.

Tall, succulent ; leaves large, oblong or rounded ; clusters axillary and in terminal simple or lobed spikes . . . . . *A. Blitum* var. *oleracea*.

Fruit ovoid, rugose, indehiscent or dehiscent ; leaves obtuse, rarely retuse or 2-lobed ; clusters all axillary . . . . . 7. *A. polygamus*.

Stamens 2 ; sepals 2 ; fruit orbicular, compressed, membranous, indehiscent ; clusters minute, all axillary ; leaves small, linear-oblong, obtuse or 2-lobed at the apex . . . . . 8. *A. tenuifolius*.

1. *A. spinosus*, Linn. *Sp. Fl.* 991 ; Roxb. *Fl. Ind.* iii, 611 ; F. B. I. iv, 718 ; Watt E. D. ; Comm. Prod. Ind. 63 ; Frain Beng. Pl. 869 ; Cooke *Fl. Bomb.* ii, 488.—Prickly Amaranth.

An erect spinous herb. *Stems* terete, glabrous, hard, often tinged with red ; branches grooved, armed with sharp straight divaricate spines in the leaf axils. *Leaves*  $1\frac{1}{4}$ -4 in. long, ovate or lanceolate, obtuse and spine-tipped, glabrous on upper surface, often scurfy beneath ; main lateral nerves close, prominent beneath ; petiole equalling or shorter than the blade. *Flowers* many, sessile, in dense axillary clusters or in terminal and axillary more or less interrupted spikes ; bracts usually longer than the sepals, linear and tipped with a bristle. *Perianth* of male flowers  $1\frac{1}{5}$ - $\frac{1}{2}$  in. long, with ovate acute bristle-tipped segments ; perianth of female flowers much smaller and with oblong obtuse apiculate segments. *Stamens* 5. *Capsule*  $\frac{1}{8}$  in. long, ovoid, thickened above, rugose ; styles 2, spreading. *Seeds* black and shining.

Found abundantly in all parts of the area, and often troublesome as a weed in fields and gardens. *DISTRIB.* : Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya ; extending to all tropical countries. The ashes of this plant are used in dyeing, the leaves are often eaten as spinach, and the roots are much used in native medicine.

2. *A. paniculatus*, Linn. *Sp. Pl. ed. 2*, 1406; *F. B. I. iv*, 718; *Watt E. D.*; *Comm. Prod. Ind.* 63; *Duthie Field and Gard. Crops*, *N. W. Prov. and Cudh.*, part iii, 23, t. 68; *Collett Fl. Siml.* 411; *Prair Beng. Pl.* 370; *Cooke Fl. Bomb. ii*, 439; *A. frumentaceus*, Buch.-Ham. in *Roxb. Fl. Ind. iii*, 609; *Royle Ill.* 320; *A. DC. L'Orig. Pl. Cult.* 382. *A. Anardana*, Buch.-Ham.; *Royle Ill.* 321.—Vern. *Chua*, *marsa*, *bathu*, etc.

A tall robust annual, up to 6 ft. high or more. *Stem* stout, grooved striate and often tinged with red. *Leaves* 2-6 in. long, elliptic or ovate-lanceolate, acute or acuminate, base cuneate; main lateral nerves slender, prominent beneath; petioles 1-4 in. long. *Spikes* dense, many-flowered, subsquarrose, red, green or golden-coloured, the whole forming a thyrsoid panicle of which the central spike is the longest; bracts recurved, much longer than the sepals. *Perianth*  $\frac{1}{16}$ - $\frac{1}{8}$  in. long. *Sepals* 5, oblong, lanceolate, acute and shortly awned. *Stamens* 5. *Fruit* a capsule,  $\frac{1}{8}$  in. long, ovoid and narrowing to the apex; styles usually 3, short. *Seeds* subglobose, white, red or black.

Cultivated as a cold-season crop within the area, but chiefly in the Sub-Himalayan tracts; it is also found as an escape. The minute seeds are very nutritious and afford wholesome food for a large number of the poorer class of natives. *DISTRIB.*: Largely grown as an autumn crop on the outer Himalayan ranges up to 10,000 ft. or more, as well as in the hilly districts of Peninsular India. It forms a very handsome crop when in full flower, especially on the Himalaya where it is usually grown in terraces, the crimson and golden kinds mixed together. The plant occurs also in E. and W. Asia and in Africa, either cultivated or as an escape.

3. *A. caudatus*, Linn. *Sp. Pl.* 990; *F. B. I. iv*, 719; *Watt E. D.*; *Comm. Prod. Ind.* p. 63; *Duthie Field and Gard. Crops*, part iii, 24, t. 68 A; *Collett Fl. Siml.* 411; *Prair Beng. Pl.* 370; *Cooke Fl. Bomb. ii*, 491.—Vern. *Kedári-chua*.

Similar in many respects to *A. paniculatus*, but in its typical state it may be distinguished by its smaller size, the obtuse leaves and by the very long and drooping terminal spike; the bracts also, which are hardly recurved, do not greatly exceed in length the obovate mucronate sepals; also the utricle and seeds are smaller, the latter, as in *A. paniculatus*, varying very much in colour and shape.

This plant is cultivated for its grain in the northern portion of the area as a cold season crop, and also on the neighbouring Himalaya, where,

the grain is known under the name of *rāmdāna*. It is much grown in English gardens as well as in India as an ornamental plant under the name of "Love-lies-bleeding." In the warmer parts of Africa it takes the place of *A. paniculatus* as a grain-yielding crop.

4. *A. gangeticus*, Linn. *Syst. Nat.* ed. 10, 1268; Foxb. *Fl. Ind.* iii, 606; Royle *Ill.* 321; F. B. I. iv, 719; Watt *E. D.*; *Comm. Prod. Ind.* 62; Duthie *Field and Gard. Crops*, part iii, 17, t. 67; Prain *Beng. Pl.* 870; Cooke *Fl. Bomb.* ii, 489. A oleraceus, Willd. (not Linn.); Roxb. l. c. 605; Watt *E. D.*; *Comm. Prod. Ind.* 62. *A. lanceolatus*, Roxb. l. c. 607; Watt *E. D.*; *Comm. Prod. Ind.* 62. *A. atropurpureus*, Roxb. l. c. 608; F. B. I. iv, 722; Watt *E. D.* *A. tricolor*, Willd.; Roxb. l. c. 608. *A. melancholicus*, Willd.; Roxb. l. c. 608; Royle *Ill.* 320; Watt *E. D.* *A. lividus*, Willd.; Roxb. l. c. 605; Watt *E. D.*; *Comm. Prod. Ind.* 62.—Vern. *Lāl-sag*, *chauli-sag*, *labra* (Merwara).

An erect stout glabrous annual. Stem 2-4 ft. high, branching above the middle, grooved and striate, glabrous or nearly so, often tinged with purple. Leaves very variable both as to size and colour, rhomboid or deltoid-ovate, obtuse or emarginate and often apiculate at the apex, tapering to the base and decurrent on the petiole; petioles up to 3 in. long. Flowers in axillary clusters and also forming long interrupted spikes; bracts membranous, exceeding the perianth, narrowly lanceolate and tipped with a slender awn. Perianth  $\frac{1}{2}$  in. long. Sepals 3, lanceolate, tipped with a long capillary awn. Stamens 3. Capsule  $\frac{1}{10}$  in. long, ovoid abruptly narrowed at the apex, rugose, membranous; styles 3, distinct. Seeds lenticular, black and shining.

Largely cultivated throughout India and in Ceylon and in other parts of Tropical Asia; also in Trop. Africa and America. This is an extremely variable plant especially in Bengal. The species described by Roxburgh, and enumerated above as synonyms of *A. gangeticus*, are regarded by Prain as representing well-marked races, some of which, and more particularly *A. oleraceus*, include many more or less distinguishable and definite sub-races or cultivated forms.

VAR. *tristis*, Prain *Beng. Pl.* 870; Cooke *Fl. Bomb.* ii, 490. *A. tristis*, Willd.; Roxb. *Fl. Ind.* iii, 604. *A. polygamus*, Willd. (not of Linn.); Roxb. l. c. 603. *A. mangostanus* L.; F. B. I. iv, 720; Watt *E. D.*; Prain *Beng. Pl.* 871. An annual herb, branching from near the base. The leaves are as variable in shape and colour as are those of the type, from which it chiefly differs in that the plants can be cut down several times without injuring them, a new crop of shoots springing

up. Roxburgh states that the plant is known only in cultivation, and that it is held in great esteem as a pot-herb by all classes of the natives.—*A. mangostanus*, L. is very probably only a stunted and prostrate form of *A. gangeticus*, or a feral state of the variety *tristis* as suggested by Prain. *A. polygamus* of Roxburgh (now regarded as a synonym of *A. tristis*) is described by him as sometimes having the terminal clusters in spikes as in *A. gangeticus*.

5. *A. viridis*, Linn. *Sp. Pl. ed. 2*, 1405; *Roxb. Fl. Ind. iii*, 605; *F. B. I. iv*, 720; *Watt E. D.*; *Comm. Prod. Ind. 63*; *Prain Beng. Pl. 871*; *Cooke Fl. Bomb. ii*, 490. *A. fasciatus*, *Roxb. l. c.* 609.

An erect much-branched glabrous annual, 1-2 ft. high; branches sulcate, often tinged with purple. *Leaves* 1-3 in. long, ovate or deltoid-ovate, rounded and usually notched at the apex, the base truncate or cuneate, petioles  $\frac{1}{2}$ -2 in. long. *Flowers* shortly stalked, pale-green, arranged in small axillary clusters and in slender axillary and terminal panicle-like racemes; bracts shorter than the sepals, ovate-oblong, acute, membranous and with a green keel. *Sepals* 3, similar to the bracts, but longer. *Stamens* 3. *Fruit* indehiscent, compressed, suborbicular, acute, rugose. *Seeds* minute, lenticular, black and shining.

A common weed in cultivated ground throughout India, flowering during the rainy and cold seasons. It is widely distributed in all tropical countries, and may be easily recognised by its slender panicle-like spikes and indehiscent herbaceous fruits. The tender tops are eaten. Roxburgh's *A. fasciatus* is regarded as a sport with a pale crescent-shaped band across the leaf.

6. *A. Blitum*, Linn. *Sp. Pl.* 990; *F. B. I. iv*, 721; *Watt E. D.*; *Prain Beng. Pl. 871*.

A glabrous procumbent annual. *Leaves* small, long-petioled, oblong ovate or rounded, usually 2-lobed at the apex; base acute. *Flowers* in axillary clusters. *Sepals* 3, shorter than the utricle, linear-oblong or lanceolate, obtuse and apiculate or acute. *Stamens* 3. *Utricle* orbicular or broadly ovate, membranous, usually indehiscent.

A common weed throughout India and in Ceylon, extending to many other countries in temperate and tropical regions. The plant is much used as a pot-herb in India.

VAR. *oleracea*, *F. B. I. iv*, 721; *Watt E. D.*; *Duthie Field and Garden Crops*, part iii, 18; *Prain Beng. Pl. 871*; *Cooke Fl. Bomb. ii*, 490.—*Vern. Chaulai*.—A tall erect glabrous succulent herb. *Stem* stout,

grooved and striate. *Leaves*  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, ovate-oblong or rounded, usually notched at the apex; base cuneate; nerves prominent beneath; petioles  $1-2\frac{1}{2}$  in. long. *Flowers* in axillary clusters and in terminal simple or branched spikes; bracteoles shorter than sepals. *Sepals* 3, linear-oblong, obtuse or acute. *Stamens* 3. *Utricle*  $\frac{1}{10}$  in. long, broadly ovate and with a blunt apex; styles 3, very short. *Seeds* lenticular, dark-brown and shining.—Cultivated throughout India and in Ceylon. The leaves are extensively used as a pot-herb, and in the submontane tracts of Garhwal and Kumaon; this plant is grown also for its grain, and the parched seeds are either eaten with milk or mixed with sugar and made up into sweetmeat balls (*lādus*).

**7. *A. polygamus*, Linn. Amœn. Acad. iv, 294; Royle, Ill. 321; F. B. I. iv, 721; Watt E. D.; Comm. Prod. Ind. 63; Prain Beng. Pl. 871; Cooke Fl. Bomb. ii, 491. *A. polygonoides*, Willd.; Roxb. Fl. Ind. iii, 602; Royle l. c.**

A diminutive annual glabrous weed. *Stems* prostrate or ascending, striate. *Leaves*  $\frac{3}{4}$ -1 in. long, obovate, obtuse, rarely retuse or somewhat 2-lobed at the apex, often rigid and apiculate, base tapering; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* few, in axillary clusters; bracteoles membranous, shorter than the sepals, lanceolate-oblong, slightly awned, mid-nerve prominent. *Perianth*  $\frac{1}{10}$ - $\frac{1}{15}$  in. long. *Sepals* 3, ovate-oblong, awned. *Stamens* 3. *Fruit* ovoid, rugose, tapering upwards, usually circumscissile; styles 3, distinct. *Seeds* lenticular, black and shining.

A common weed in gardens and cultivated land throughout India and in Ceylon, extending to Trop. Africa. Though not cultivated, this plant is largely used in India as a pot-herb, and is considered to be very wholesome. It is closely allied to *A. Blitum*.

**8. *A. tenuifolius*, Willd. Sp. Pl. iv, 381; Roxb. Fl. Ind. iii, 602; F. B. I. iv, 722; Watt E. D.; Prain Beng. Pl. 871; Cooke Fl. Bomb. ii, 491.**

A glabrous annual weed; branches many from the root, 6-18 in. long, spreading, prostrate or ascending. *Leaves*  $\frac{1}{2}$ -1 in. long, linear or oblanceolate-oblong, rounded and usually notched at the apex, base tapering; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, often obscured by the decurrent leaf-blade. *Flowers* in minute axillary clusters, bracteoles shorter than the sepals, ovate-lanceolate, obtuse, mid-nerve green. *Perianth*  $\frac{1}{10}$  in. long. *Sepals* 2, ovate-oblong, subacute, concave. *Stamens* 2. *Utricle* indehiscent,  $\frac{3}{10}$  in. in diam., orbicular, compressed, membranous, plicate when dry. *Seeds* lenticular, brown and shining.

A common weed in the plains of N. India; also in Western India, extending to Trop. Africa and other warm countries.

5. *ÆRUA*, Forsk.; Fl. Brit. Ind. iv, 727.

Erect prostrate or climbing herbs or undershrubs, often woody. *Leaves* alternate opposite or fascicled. *Flowers* small or minute, in simple or paniced spikes, 2-sexual or polygamous; bracts and bracteoles small. *Perianth* membranous or papery, sepaline, 5 (rarely 4) -lobed; segments equal or the outer broader. *Stamens* 5, rarely 4; filaments subulate, connate, with short or long intervening staminodes in a short hypogynous cup; anthers 2-celled. *Ovary* ovoid or subglobose; style simple, long or short, stigma capitellate or stigmas 2; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous utricle or a circumscissile capsule with a coriaceous crown. *Seed* inverse, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear, radicle superior.—Species about 15, in Trop. Asia and Africa.

Spikes axillary and terminal :—

Erect; leaves alternate, flowers dioecious . . . 1. *Æ. tomentosa*.

Climbing; leaves alternate and opposite; flowers  
2-sexual . . . . . 2. *Æ. scandens*.

Spikes all axillary; leaves alternate; flowers 1-  
sexual and 2-sexual . . . . . 3. *Æ. lanata*.

1. *Æ. tomentosa*, Forsk. Fl. *Ægypt.-Arab. caxii* and 727; Fl. Trop. Afr. vi, 37. *Æ. javanica*, Wight; Royle Ill. 320; F. B. I. iv, 727; Watt E. D.; Cooke Fl. Bomb. ii, 493. *Æ. Bovii*, Edgew. in Journ. Linn. Soc. vi, 206. *Achyranthes incana*, Roxb. Fl. Ind. i, 671.—Vern. *Chin* (Merwara).

A hoary tomentose undershrub, 2-3 ft. high. *Stem* branched, terete, as thick as a goose quill, densely stellate-tomentose. *Leaves* alternate, sessile or nearly so, 1-2½ in. long, linear-oblong or oblong-spathulate, acute obtuse or somewhat retuse, densely tomentose. *Flowers* dioecious, sessile, in densely woolly oblong or linear spikes 1-6 in. long and forming leafless terminal panicles; bracteoles ovate, acute, hyaline. *MALE* flowers: *Perianth* about ⅓ in. long. *Sepals* elliptic-oblong, woolly on the back. *Ovary* rudimentary, with short style and bifid,



stigma. FEM. flowers: *Perianth*  $\frac{1}{10}$  in. long. *Sepals* subacute, apiculate. *Stigmas* 2, equalling the style. *Utricle* broadly ovoid. *Seeds* dark-brown and shining.

Abundant in the dry western and south-western portions of the area, also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.:** Punjab, Rajputana, Sind, Central India and southwards through the W. Peninsula to Ceylon, also in Burma and Baluchistan, extending to Arabia, Trop. Africa and the Cape de Verde Islands. Edgeworth insists that his *Æ. Borii* is a distinct species. It has much narrower leaves and is sweet-scented, whilst *Æ. javanica*, which grows with it, is not. Bossier regarded it as a variety. I have seen no specimens from the area of this flora.

2. *Æ. scandens*, Wall. Cat. 6911; Royle Ill. 320; F. B. I. iv, 727; Watt. E. D.; Collett Fl. Siml. 414; Prain Beng. Pl. 874; Cooke Fl. Bomb. ii, 492. *Achyranthes scandens*, Roxb. Fl. Ind. i, 676.

A climbing undershrub with long hoary tomentose branches. *Leaves* alternate and opposite,  $1\frac{1}{2}$ -4 in. long, elliptic-lanceolate or ovate, obtuse or acute and mucronate, glabrous or softly hairy, base tapering into a short petiole. *Flowers* silvery-white, 2-sexual, arranged in ovoid or cylindric axillary and terminal subsessile white-woolly spikes  $\frac{1}{4}$ -1 in. long, the spikes often in pairs and forming a lax terminal panicle; bracteoles shorter than the sepals, ovate, acuminate. *Perianth*  $\frac{1}{10}$  in. long. *Sepals* lanceolate, acuminate. *Utricle* broadly ovate, acute. *Seeds* lenticular, black and shining.

Common in most parts of the area in waste ground, and often found climbing amongst bushes. **DISTRIB.:** Plains of Upper India from the Punjab to Bengal and Assam; outer Himalayan ranges from Kumaon to Bhutan up to 5,000 ft., also in C. and W. India and extending to China, Malay Islands, Philippines and Trop. Africa.

3. *Æ. lanata*, Juss. in Mus. Par. ii, 131; F. B. I. iv, 728; Watt E. D.; Prain Beng. Pl. 874; Cooke Fl. Bomb. ii, 493. *Achyranthes lanata*, Linn.; Roxb. Fl. Ind. i, 676.

An erect or prostrate undershrub. *Branches* many from a stout woody rootstock, terete and striate, pubescent or woolly. *Leaves* petioled, alternate,  $\frac{3}{4}$ -1 in. long, those of the branches smaller, elliptic-obovate or suborbicular, obtuse or acute, entire, pubescent above and usually white-woolly beneath. *Flowers* minute, greenish-white, sessile, 1-or 2-sexual, arranged in small dense axillary heads or spikes which are



sometimes crowded into globular clusters; bracteoles ovate, concave, apiculate. *Perianth*  $\frac{1}{5}$  in. long, oblong, obtuse and often apiculate, silkily hairy on the back. *Utricle* ovoid, acute. *Seeds* black and shining.

An abundant weed over the greater portion of the area. **DISTRIB.:** Throughout the hotter parts of India and up to 3,000 ft. on the hills; also in Ceylon, extending to Arabia, Trop. Africa, Java and the Philippines. This plant is in general appearance very similar to, and may easily be mistaken for, *Nothosæra brachiata*. The woolly spikes are often used for stuffing pillows.

Æ. MONSONIA, Mart.; *F. B. I. iv*, 728; *Prair Beng. Pl.* 874; *Cooke Fl. Bomb. ii*, 493. *Achyranthes monsonia*, Pers.; *Roxb. Fl. Ind. i.*, 673.—This species will very probably be found growing within the dry southern border of the area of this flora. It is common in Chota-Nagpur, W. Bengal, in C. and W. India, as well as in Burma. Leaves filiform, in fascicles; flowers in peduncled spikes, 2-sexual, pale pink; perianth-segments 4.

#### 6. NOTHOSÆRUA, Wight; *Fl. Brit. Ind. iv*, 726.

An annual with opposite spreading branches. *Leaves* opposite. *Flowers* very minute, 2-sexual, woolly, arranged in axillary solitary or clustered spikelets, bracteate and 2-bracteolate. *Sepals* 3-5, hyaline, obtuse, 1-nerved. *Stamens* usually 2, free; anthers 2-celled; staminodes none. *Ovary* oblong, compressed; stigma subsessile, capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* a membranous oblong compressed utricle, enclosed within the perianth. *Seed* inverse, lenticular; testa crustaceous; embryo hooked, surrounding floury albumen; cotyledons linear, radicle superior. A single species, found in Asia and in Trop. Africa.

**N. brachiata**, *Wight Ic. vi. 1*; *F. B. I. iv*, 726; *Watt E. D.*; *Cooke Fl. Bomb. ii*, 495. *Pseudanthus brachiatus*, *Wight Ic. v, t. 1776* (excl. analysis), and *vi, t. 1776 bis, fig. B*.

An erect slender herb, 1-2 ft. high, glabrous or minutely puberulous. *Stem* branched from the base, branches spreading. *Leaves* thinly membranous,  $\frac{3}{4}$  to  $1\frac{1}{2}$  in. long, elliptic-lanceolate, acute or subobtuse, tapering to the base; petiole short or obscure. *Flowers* sessile, glistening-white, crowded in small dense axillary subsessile cylindric

spikes  $\frac{1}{2}$ - $\frac{1}{2}$  in. long; bracts and bracteoles hyaline, acute, persistent. *Perianth*  $\frac{1}{8}$  in. long, villous with silky hairs. *Sepals* acute or subacute, hyaline. *Seeds* minute, black and shining.

Near Saharanpur (Edgeworth), Moradabad (T. Thomson), Oudh (Wallich), Bundelkhand and Merwara (Duthie). *DISTRIB.*: Punjab Plain, Sind, C. Prov., and south to Mysore and Ceylon; also in Burma, extending to Mauritius and Trop. Africa. This plant is very similar in general appearance to *Ærua lanata*.

#### 7. *ACHYRANTHES*, Linn.; Fl. Brit. Ind. iv, 729.

Herbs, often woody below. *Leaves* opposite, entire, petioled. *Flowers* 2-sexual, in slender simple or paniced spikes, soon deflexed; bracts and bracteoles spinescent. *Perianth-segments* 4-5, sepaline, rigid, somewhat connate below, lanceolate, aristate, shining, at length hardened and strongly ribbed. *Stamens* 2-5; filaments connate at the membranous base, with as many quadrate staminodes, each of which is toothed or has a toothed scale at its back; anthers 2-celled. *Ovary* oblong, subcompressed; style filiform, stigma capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* an oblong or ovoid utricle, areolate or rounded at the apex. *Seed* inverse, oblong, testa coriaceous; embryo annular, surrounding the floury albumen, cotyledons linear or lanceolate, radicle erect.—Species about 15, in tropical and subtropical regions.

*A. aspera*, Linn. *Sp. Pl.* 204; Roxb. *Fl. Ind.* i, 672; Royle *III*, 321; F. B. I. iv, 730; Watt *E. D.*; Collett *Fl. Siml.* 414; *Proc. Ben. Pl.* 875; Cooke *Fl. Bomb.* ii, 495. Vern. *Chirchita*.

A coarse weed, 1-3 ft. high. *Stem* erect, simple or slightly branched; branches striate, pubescent. *Leaves* very variable, up to 5 in. long, elliptic obovate or suborbicular, usually rounded at the apex, tomentose or velvety on both surfaces, rarely glabrate; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long. *Flowers* many, greenish-white, sharply deflexed against the stout pubescent rachis of the terminal spikes which elongate in fruit up to as much as 20 in. in length; bracts shorter than the perianth, ovate, acuminate, aristate, persistent; bracteoles about as long as the bracts, ending in a spine which hardens in fruit and remains attached to the fruiting perianth. *Perianth*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, glabrous and shining; sepals ovate-oblong, acuminate, white-margined.

*Stamens* 5; staminodes truncate, fimbriate. *Utricle* oblong, enclosed in the hardened perianth. *Seed* subcylindrical, with a truncate apex, brown.

A very common weed of way-sides and waste places all over the area. **DISTRIB.:** Throughout India and in Ceylon, extending to Trop. Asia, Africa, Australia and America. The plant is used medicinally for various purposes. There appears to be amongst many of the peasant people of N. India a general belief in its efficacy as an antidote for the poison of snakes and scorpions. Colonel Madden mentions that in Oudh the plant is considered to have a paralyzing effect on scorpions. The fruit, when ripe, becomes easily detached from the rachis, carrying with it the hardened persistent perianth to which are attached the spine-like bracteoles.

**S. PUPALIA**, Juss. ; Fl. Brit. Ind. iv, 723.

Herbs or undershrubs. *Leaves* opposite, petioled. *Flowers* fascicled in simple or panicled spikes; fascicles containing one perfect flower, and several imperfect ones, the perianth-segments of which are reduced to stellately spreading hooked bristles; bracts and bracteoles scarious; perianth-segments of perfect flowers 5, slightly connate below, herbaceous, rarely equal, lanceolate, acuminate, 3-5-nerved. *Stamens* 5, filaments slightly connate below, anthers 2-celled, staminodes none. *Ovary* ovoid, style slender, stigma capitellate; ovule solitary, pendulous from a long basal funicle. *Fruit* an ovoid membranous utricle, enclosed in the perianth, its apex areolate. *Seed* inverse, lenticular, rostellate, testa thinly coriaceous, embryo annular; cotyledons linear, flat, radicle ascending. —Species 5, in Asia and Africa.

**P. lappacea**, Juss. in. Ann. Mus. Par ii, 132; F. B. I. iv, 724; Prain Beng. Pl. 872; Cooke Fl. Bomb. ii, 497.

A large straggling undershrub; branches terete, tomentose. *Leaves* petioled, membranous,  $1\frac{1}{2}$ -4 in. long, ovate or elliptic, acute or acuminate, tomentose on both surfaces, ciliate; base rounded or shortly cuneate; main nerves many, prominent beneath. *Flowers* in approximate or distant clusters arranged in terminal spikes 4-10 in. long; rachis slender, tomentose; bracts  $\frac{1}{2}$ - $\frac{1}{3}$  in. long, ovate, acuminate, pungent, villous; bracteoles  $\frac{1}{2}$  in. long, ovate-oblong, apiculate, concave. *Perianth*  $\frac{1}{2}$  in. long. *Sepals* lanceolate, aristate, 3-nerved, densely white-woolly. *Sterile flowers* reduced to a number of un-

equal glabrous hooked awns, enlarging, stellately spreading, yellowish during the fruiting time and supported during the flowering period by a lanceolate acute 3-nerved aristate bracteole. *Utricle* thinly membranous, oblong and abruptly narrowed to the apex. *Seed*  $\frac{1}{10}$  in. long, ellipsoid, compressed, black and shining.

Dehra Dun, Siwalik range and in the Sub-Himalayan tracts eastwards; also in Bundelkhand and Merwara. Flowers towards the end of the rainy season. *DISTRIB.*: Behar, Punjab Plain and up to 3,000 ft. on the W. Himalaya; also in Rajputana, Sind and Deccan Peninsula, extending to S. E. Asia, Trop. Africa and Madagascar.

### 9. *ALTERNANTHERA*, Forsk.; Fl. Brit. Ind. iv, 731.

Herbs, usually prostrate. *Leaves* opposite. *Flowers* 2-sexual, small, white, in axillary often clustered heads. *Perianth-segments* 5, sepaline, unequal; anterior and 2 posterior flattened; the 2 lateral ones innermost, concave. *Stamens* 2-5; filaments short, connate in a short cup, with or without interposed staminodes; anthers 1-celled. *Ovary* suborbicular or ovoid, style very short, stigma capitellate, rarely 2-fid.; ovule solitary, pendulous from a long basal funicle. *Fruit* a compressed orbicular or obcordate utricle, often with thickened or winged margins. *Seed* inverse, lenticular, testa crustaceous; embryo annular, surrounding the floury albumen, cotyledons narrow, radicle superior.—Species about 16, in tropical and sub-tropical regions, abundant in Australia and America.

*A. sessilis*, R. Br. *Prod.* 417; Royle *Ill.* 320; F. B. I. iv, 731; Watt *E. D.*; Collett *Fl. Siml.* 415; Prain *Beng. Pl.* 875. *A. triandra*, Lamk.; Cooke *Fl. Bomb.* ii, 499. *A. prostrata*, Don. *Prodr.* 86, *Achyranthes triandra*, Roxb. *Fl. Ind.* i, 678. Vern. *Ghardugh* (Rohilkhand).

A prostrate herb; branches many, often rooting from the lower nodes, glabrous or the younger ones with 2 opposite lines of hairs. *Leaves* shortly stalked, glabrous and rather fleshy,  $\frac{1}{2}$ -2 in. or more long, linear-oblong lanceolate or elliptic, obtuse or subacute, sometimes subdenticulate. *Flowers* sessile, white and shining, arranged in small axillary sessile heads; bracteoles ovate, scarious. *Perianth*  $\frac{1}{10}$ - $\frac{1}{8}$  in. long. *Sepals* ovate, acute, 1-nerved, scarious. *Ovary* broader than long, compressed. *Utricle* broadly obcordate, margins thickened. *Seed* suborbicular.

Common in all parts of the area in waste places and as a weed of cultivation. **DISTRIB.:** Throughout India and in Ceylon and up to 4,000 ft. on the Himalaya, extending to all warm countries.

*GOMPHRENA GLOBOSA*, Linn.; Roxb. *Fl. Ind.* ii, 63; F. B. I. iv, 732; Watt *E. D.*; Prain *Beng. Pl.* 376; Cooke *Fl. Bomb.* ii, 499. (The Globe amaranth).—A tall much-branched annual, hairy or subsilky. *Leaves* shortly stalked, pale-green, 2-4 in. long, elliptic or obovate-oblong. *Heads* large, globose, terminating the branches, yellowish-white or crimson; bracts leafy; bracteoles pinkish-purple. *Sepals* densely woolly, shorter than the long staminal tube. *Anthers* 1-celled. *Stigma* 2-fid.—Much cultivated in Indian gardens and often met with as an escape. Cultivated in most warm countries, having probably originated in America. It flowers in India during the rainy and cold seasons.

### XCI.—CHENOPODIACEÆ.

Annual or perennial herbs or shrubs. *Leaves* usually alternate, simple, exstipulate. *Flowers* small, usually green, 1- or 2-sexual, usually regular, often dimorphic; bracts 1 or none, bracteoles none or 2. *Perianth* simple, sepaline, of 3-5 free or connate sepals, imbricate, often wanting in female flowers. *Stamens* usually 5, opposite the perianth-segments, perigynous or hypogynous; filaments free, sometimes with intervening staminodes; anthers 2-celled. *Ovary* ovoid globose or depressed, 1-celled; style terminal, short or long; stigma capitate or 2-3-lobed; or stigmas 2-5, free or slightly united; *ovule* solitary, basal or lateral, campylo-tropous. *Fruit* a small utricle, rarely a circumscissile capsule, enclosed in the often enlarged fleshy perianth when the latter is present. *Seeds* erect, inverse or horizontal, crustaceous coriaceous or membranous; albumen floury or fleshy or none; embryo curved, annular or spiral.—Species about 520, widely dispersed throughout the world, and chiefly in saline soils.

Stems not twining; bracteoles free from the perianth; anthers erect or incurved in bud:—

Leaves flat; embryo annular or horseshoe-shaped:—

Fruiting perianth not winged; albumen

copious . . . . . 1. CHENOPODIUM.

Fruiting perianth with transverse wings;

albumen scanty . . . . . 2. KOCHIA.

Leaves fleshy,  $\frac{1}{2}$  terete; embryo spiral; albumen none :—

Sepals not winged . . . . . 3. *SUÆDA*.

Sepals transversely winged . . . . . 4. *SALSOLA*.

Stems twining to the right; leaves flat, membranous; bracteoles 2, broad, adnate to the face of the perianth; anthers versatile; embryo spiral. 5. *BASELLA*.

### 1. *CHENOPODIUM*, Linn.; Fl. Brit. Ind. v, 3.

Annual or perennial erect or prostrate herbs. *Leaves* alternate, entire lobed or toothed. *Flowers* minute, 2-sexual, in axillary clusters or cymes; bracts and bracteoles none. *Perianth* usually 5-lobed; segments concave, incurved. *Stamens* 5 or fewer, hypogynous or almost perigynous, anthers 2-celled. *Disk* none or annular. *Ovary* depressed-globose, rarely ovoid; stigmas 2-5, sometimes united below in a style; ovule solitary, sessile. *Fruit* a membranous utricle, enclosed in the perianth. *Seed* usually horizontal, testa crustaceous or coriaceous, embryo nearly or quite annular, surrounding the floury albumen. Species about 60, in all parts of the world. The fruit of some of the species is dimorphic.

A tall scentless herb; seeds smooth and shining . . . 1. *C. album*.

A low rather foetid herb; seeds rugose, dull-black . . . 2. *C. murale*.

1. *C. album*, Linn. *Sp. Pl.* 219; *Roxb. Fl. Ind.* ii, 58; *F. B. I.* v, 3; *Duthie Field and Gard. Crops, N. W. Prov. and Oudh, part iii*, 21; *Watt E. D.*; *Comm. Prod. Ind.* 293; *Collett Fl. Siml.* 416; *Prain Beng. Pl.* 878; *Cooke Fl. Bomb.* ii, 501. *C. giganteum*, Don *Prod.* 74. *C. viride*, Linn.; *Roxb. Fl. Ind.* ii, 58. *C. laciniatum*, Linn.; *Roxb. l. c.* 59. *C. purpurascens*, Buch.-Ham. in *Wall. Cat.* 6955.—*Vern. Bathu, bathu-ság, chel* (Merwara). White Goose-foot.

An erect herb, 1-10 ft. or more high, green or more or less coated with white mealy pubescence, inodorous. *Stems* angled, often tinged with red or purple. *Leaves* very variable in size and shape, entire toothed or lobed; petioles slender, often equalling or longer than the blade. *Flowers* in clusters, forming compact or loosely panicle spikes, becoming thyrsoid under cultivation. *Sepals*  $\frac{1}{16}$ – $\frac{1}{12}$  in. long, oblong-lanceolate, keeled on the back, closely investing the thin membranous utricle. *Stigmas* 2. *Seed*  $\frac{1}{16}$  in. in diam. orbicular, compressed and with an acute margin, black and shining.

A very common weed throughout the area especially in cultivated ground and in waste places, very variable. **DISTRIB.:** Plains of Punjab and Bengal, extending to S. India; also on the Himalaya from Kashmir to Sikkim up to 12,000 ft., and to still higher elevations in W. Tibet; also on the Khasia Hills where it is cultivated. The plant is very rich in potash salts and the leaves are often eaten raw as a salad or cooked as a pot-herb, and on the W. Himalaya it is much grown for its grain. Baden-Powell mentions that in the Punjab this plant is sometimes used in cleaning copper vessels preparatory to tinning them. In *C. viride* the leaves are narrower than in the type and almost entire, and the plant is much less mealy.

2. *C. murale*, Linn. *Sp. Pl.* 219; *F. B. I. v.* 4; *Watt E. D.*; *Cooke Fl. Bomb.*, ii. 501.

A subglabrous rather foetid herb. *Stem* 6-15 in. high, branches erect of ascending. *Leaves* stalked, bright-green and somewhat shining, 1-3 in. long, rhombic or deltoid-ovate, obtuse or acute, margins irregularly lobed and more or less sharply toothed, entire at the cuneate base. *Flowers* clustered in lax or dense cymes arranged in axillary racemes or panicles, the terminal leafless panicle much shorter than in *C. album*. *Sepals*  $\frac{1}{2}$  in. long, oblong, subacute, closing over the utricle, slightly keeled. *Stigmas* 2. *Seeds* horizontal, orbicular, compressed, sharply keeled, dull-black, rugose.

Upper Gangetic Plain (T. Thomson), N. W. India (Royle). **DISTRIB.:** Punjab Plain (Edgeworth, etc.), and on the Himalaya in Kumaon and Nepal; Western and S. India, but Cooke says "scarcely indigenous in the Bombay Presidency"; also in Ceylon, extending to W. Asia, N. Africa and Europe, but introduced in N. America. The plant is used as a pot-herb in the Punjab.

2. *KOCHIA*, Roth; *Fl. Brit. Ind.* v, 10.

Herbs or undershrubs, usually villous or pubescent. *Stems* slender. *Leaves* alternate, sessile, narrow, entire. *Flowers* minute, axillary, solitary or in clusters, 2-sexual and female, rarely only male, ebracteate. *Perianth* subglobose; lobes 5, coriaceous, incurved and ultimately closing over the utricle, girt by 5 free or confluent wings. *Stamens* 5, usually exserted; anthers large, ovate. *Ovary* depressed-globose; style slender, stigmas 2 or 3, capillary. *Fruit* a depressed membranous utricle. *Seed* ovoid or



orbicular, horizontal, testa membranous, albumen scanty, embryo annular. Species about 20, in Temp. Asia, N. and S. Africa and in N. W. America.

**K. indica**, *Wight Ic.* 1791; *F. B. I. v.* 11; *Watt E. D.*; *Comm. Prod. Ind.*; *Cooke Fl. Bomb. ii*, 503.—*Vern. But.*

A tall erect annual, diffusely branching from the base. *Stem* and branches white, more or less villous or woolly, striate. *Leaves*  $\frac{1}{2}$ - $1\frac{1}{2}$  in. long, elliptic or linear-lanceolate, acute, hairy on both surfaces, base tapering. *Flowers* axillary, solitary or in pairs. *Perianth* about  $\frac{1}{10}$  in. across (when spread out), divided about  $\frac{1}{2}$  of the way down, woolly; segments hooded, mucronate; wings (in fruit) broadly triangular-ovate, scarious. *Utricle* thinly membranous; stigmas 2, filiform. *Seed*  $\frac{1}{16}$  in. in diam., orbicular or ovoid, black.

In the neighbourhood of Delhi (F.B.I.). **DISTRIB.**: Plains of Punjab and Sind, also in the drier parts of S. India, extending to Afghanistan. The plant is sometimes used as fodder for camels.

### 3, **SUÆDA**, Forsk.; *Fl. Brit. Ind. v.* 13.

Herbs or shrubs. *Leaves* fleshy, ternate, terete, rarely flattish. *Flowers* minute, axillary, usually 2-sexual, bracteate and 2-bracteolate. *Perianth* short, globose or urceolate, 5-lobed or -partite; segments equal or not, simple, gibbous or almost winged. *Stamens* 5, filaments short, anthers large. *Ovary* usually sessile, with a wide base, adnate below to the perianth, style none, stigmas 2-5, minute, subulate, recurved. *Fruit* a small membranous or spongy utricle, included within the perianth. *Seed* erect, oblique or horizontal, testa crustaceous or coriaceous, albumen scanty or none, embryo slender and somewhat spiral. Species about 40, usually on desert saline tracts and sea-shores.

Perennial; stigmas 3; seed usually erect. . . . . 1. *S. fruticosa*.

Annual or occasionally perennial; stigmas 2; seed usually horizontal . . . . . 2. *S. maritima*.

1. **S. fruticosa**, *Forsk. Fl. Egypt.-Arab.* 70, t. 9; *F. B. I.*, v. 13; *Watt E. D.*; *Comm. Prod. Ind.* 519, *Cooke Fl. Bomb. ii*, 505. *Salsola* Lana, *Edgew. in Hook. Journ. ii*, 286.—*Vern. Lunak, choti-láni*.

A much-branched usually erect shrub. *Stem* pale, glabrous, branches usually slender. *Leaves* subsessile, fleshy, very variable,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long,



linear or ellipsoid, obtuse, narrowed to the base, floral leaves shorter. *Flowers* 2-sexual, axillary, solitary or 2 or 3 together, the upper ones forming slender leafy spikes; bracteoles membranous, shorter than the perianth, ovate, acute, entire or denticulate. *Perianth* (in fruit) subglobose, about  $\frac{1}{16}$  in. long; segments thick, oblong, concave, obtuse, incurved. *Utricle* obovoid; stigmas 3, short, spreading. *Seed* erect, obliquely ovoid, beaked, black and shining when ripe.

A common plant in saline soils, and often found as a gregarious bush in the usar tracts of the Upper Gangetic Plain and in Merwara. It flowers during the cold season. **DISTRIB.:** Plains of Punjab and Sind, also in Baluchistan, extending to Africa and the Mediterranean region. The plant is much eaten by camels, and a crude form of *barilla* is prepared from it in Sind.

2. *S. maritima*, Dumort. *Fl. Belg.* 22; *F. B. I. v.* 14; *Watt E. D.*; *Comm. Prod. Ind.* 114; *Frain Beng. Pl.* 878; *Cooke Fl. Bomb. ii.* 506. *Salsola indica*, Willd.; *Roxb. Fl. Ind. ii.* 62.—Vern. *Láni*, *Khari-láni*.

An erect annual herb or occasionally an undershrub, glaucous-green, *Stems*  $1\frac{1}{2}$ -2 ft. high, with many slender erect branches. *Leaves* many,  $\frac{3}{8}$ -1 in. long, fleshy, semiterete, linear or filiform, subacute, floral leaves very small. *Flowers* in small subglobose clusters forming slender lax elongate spikes; bracteoles membranous, ovate, entire. *Perianth* minute; segments rounded, covering the utricle. *Stigmas* 2, slender. *Seed* horizontal, obliquely ovoid or suborbicular, black and shining.

In the neighbourhood of Delhi (C. B. Clarke), also on the usar tracts in the Upper Gangetic Plain (Duthie). Flowers during the hot season. **DISTRIB.:** Sea-coast of Bengal and Bombay and in S. India and Ceylon, extending to Siam, N. and W. Asia, N. Africa, Europe and N. America. The leaves, which are quite wholesome, are eaten by the poorer classes in times of scarcity.

#### 4. *SALSOLA*, Linn.; *Fl. Brit. Ind.* v, 17.

Herbs or shrubs, branches not jointed. *Leaves* usually alternate, sessile and often amplexicaul, sometimes with pungent tips. *Flowers* small, axillary, solitary or fascicled, bracteoles 2. *Perianth* 5 (rarely 4)-partite; segments concave, accrescent in fruit, usually furnished with a broad scarious horizontal wing above the middle and completely embracing the utricle. *Stamens* 5 or fewer, usually

hypogynous. *Fruit* an ovoid or orbicular fleshy or membranous utricle; stigmas 2 or 3, subulate or linear. *Seed* usually horizontal, testa membranous, albumen none, embryo spiral.—Species about 40, in Temp. Asia, Australia and N. America.

*S. foetida*, Del. *Fl. Egypt. Ill.* (1812) n. 310; *F. B. I. v.* 18; *Watt E. D.*; *Comm. Prod. Ind.* 114; *Gamb. Man.* 552; *Brand. Ind. Trees* 519; *Cooke Fl. Bomb. ii.* 507. *S. indica*, *Herb. Royle.*—Vern. *Lána*, *shora*, *gora-lána*.

A large much-branched hoary shrub up to 4 ft. or more in height. *Stem* stout; branches densely crowded, slender. *Leaves* minute, subglobose, fleshy; the floral ones imbricate and forming very short cylindric spikes; bracteoles fleshy,  $\frac{1}{10}$  in. long, broadly ovate or orbicular. *Perianth* silvery-white, not exceeding the bracteoles, oblong, obtuse; wings symmetrical, rounded, membranous and transparent, margins often overlapping. *Stigmas* 2, large, recurved.

Found in the districts of Delhi and Agra (Royle, Munro, etc.). Flowers in the cold season. *DISTRIB.*: Plains of Punjab and Sind; also in Baluchistan, Afghanistan, and westwards to Persia, Arabia and N. Africa. This plant is much used in the preparation of *barilla* (carbonate of soda). The branchlets often bear globose villous galls  $\frac{1}{4}$ – $\frac{3}{8}$  in. in diam.; these latter are covered by linear leaves somewhat resembling the involucre of a composite. The plant is described as having a strong odour of rotten fish. It is eaten greedily by camels.

##### 5. BASELLA, Linn.; *Fl. Brit. Ind. v.* 20.

Much-branched twining fleshy herbs. *Leaves* alternate, broad, entire. *Flowers* in spikes, 2-sexual, white, red or violet; bracts minute, caducous; bracteoles 2, united into a 2-lipped cup and adnate to the perianth. *Perianth* fleshy, 5-fid.; at length berry-like; lobes short, incurved. *Stamens* 5, on the mouth of the perianth-tube; filaments short, erect in bud; anthers versatile, globose. *Styles* 3, stigmas 2, linear-clavate, papillose on the inner side, ovule sessile. *Fruit* a globose utricle, included within the fleshy perianth; pericarp thin, adnate to the seed. *Seed* erect, sub-globose, testa crustaceous, albumen scanty, embryo plano-spiral; cotyledons large, thin, involute.—Species 2, in Asia and Trop. Africa, elsewhere cultivated in the tropics.

**B. rubra**, Linn. *Sp. Pl.* 272 ; *F. B. I. v.* 20 ; *Watt E. D.* ; *Duthie Field and Gard. Crops N. W. Prov. and Oudh, part iii.* 19 ; *Prair Bengal. Pl.* 882 ; *Cooke Fl. Bomb. ii.* 509. **B. alba**, Linn. ; *Roxb. Fl. Ind. ii.* 104.—Vern. *Poi, lâl-bachlu.* (Indian Spinach.)

A glabrous fleshy perennial much-branched climbing herb, often tinged with red. *Leaves* 2-5 in. long or more, broadly ovate, acute or acuminate, thick, entire, often cordate at the base ; petioles  $\frac{1}{2}$ -1 in. long. *Flowers* sessile, white or red, in lax axillary peduncled spikes 1-6 in. long ; bracts apiculate, bracteoles longer than the perianth, oblong-obtuse. *Perianth* remaining closed, divided half-way down ; lobes elliptic, obtuse. *Utricle* red white or black, about the size of a pea.

Wild and cultivated within the area. It flowers during the cold season. **DISTRIB.**: Throughout the hotter portions of India and in Ceylon extending to other parts of Trop. Asia and to Trop. Africa. *Roxburgh* describes five varieties in Bengal, 2 of them wild and 3 cultivated ; also a further kind (*B. lucida*, L. and *B. cordifolia* Lamk.). This latter is a much larger and more succulent plant, and is the one chiefly grown in Bengal for use as a pct-herb. It is usually raised from cuttings and planted so as to climb over the roofs of native houses and on trellises, where it affords both shade and food.

The following cultivated species belonging to genera which are not indigenous within the area of this flora should be mentioned :—

**BETA VULGARIS**, Linn. ; *F. B. I. v.* 5 ; *Watt E. D.* ; *DC. L'Orig. Pl. Cult.* 46 ; *Duthie Field and Gard. Crops, part iii.* 19 ; *Prair Bengal. Pl.* 879 ; *Cooke Fl. Bomb. ii.* 509. **B. benghalensis**, *Roxb. Fl. Ind. iii.* 59.—Vern. *Chukandar, palák, palang.* (Garden beet). Extensively grown in India for its root, which is used chiefly by Europeans as a salad. *B. benghalensis* is a form with more erect branches. It is much cultivated by the natives of N. India for the sake of its leaves which are eaten as a vegetable. *B. maritima* L., from which the beet and the mangold-wurzel are supposed by some to have originated, has decumbent branches. The genus *Beta* differs from *Chenopodium* in the presence of both bracts and bracteoles, and by the perianth becoming thickened and hard at the base.

**SPINACIA OLERACEA**, Linn. ; *F. B. I. v.* 6 ; *Watt E. D.* ; *DC. L'Orig. Pl. Cult.* 78 ; *Prair Bengal. Pl.* 880 ; *Cooke Fl. Bomb. ii.* 509. *S. tetrandra*, *Roxb. Fl. Ind. iii.* 771 ; *Royle Ill.* 318.—Vern. *Palák* (Spinach). This plant is largely grown in Indian native gardens.

and is much used as a pot-herb. Its original habitat as a wild plant is not known. It differs from the Genus *Chenopodium* in having 1-sexual flowers, the males being crowded in terminal leafless spikes and the females arranged in axillary clusters.

*ATRIPLEX HORTENSIS*, Linn.; *F. B. I. v*, 6; *Watt E. D.*; *Prain Beng. Pl.* 380; *Cooke Fl. Bomb.*, ii, 502.—An erect succulent annual, often tinged with red or purple. The flowers are 1-sexual or polygamodioecious. The female flowers have no perianth, its place being taken by 2 bracteoles which become dilated and form a 2-valved covering to the utricle. The plant is extensively cultivated as a pot-herb in the plains of Upper India, as well as on the Himalaya up to 12,000 ft. In Europe it is often grown as a vegetable under the name of "Orache" or "Mountain Spinach." The origin of this species is not known for certain.

*A. NUMMULARIA*, Lindl. is an Australian shrub known in that country as the "Salt bush." It is much valued as affording good fodder for sheep in the drought-affected areas, where it is able to hold its own during very dry seasons when nearly all other vegetation disappears. For this reason it was introduced into India about twenty years ago by the writer in order to test its value as a reclamation plant on the arid tracts of the Upper Gangetic Plain. The results, however, proved to be unsatisfactory owing to the excessive moisture in that portion of India during the hot rainy season.

## XCII.—POLYGONACEÆ.

Herbs or shrubs, very rarely trees. *Leaves* usually alternate, entire or sometimes serrulate; stipules scarious or membranous, usually sheathing the stem. *Flowers* small or medium-sized, regular, usually 2-sexual, solitary or in axillary cymose clusters, pedicels usually jointed. *Perianth* inferior, simple; segments 3-6, free or connate, imbricate in bud. *Stamens* 5-8, rarely more or fewer, opposite the perianth-segments. *Disk* annular, glandular or none. *Ovary* free, sessile, 1-celled; styles 3 or 2, rarely 4, free or connate; stigmas capitate, peltate or fimbriate; ovule solitary, orthotropous, sessile or on a distinct funicle. *Fruit* a small hard nut, compressed or 3-gonous, rarely 4-gonous, enclosed in the persistent perianth.

*Seed* erect, testa membranous, albumen floury, sometimes ruminate. Species about 600, chiefly in temperate regions.

Perianth 4-5 (rarely 3)-cleft; stigmas capitellate;  
fruit a compressed or 3-gonous nutlet . . . . . 1. POLYGONUM.

Perianth 6-cleft, the 3 inner segments much enlarged in fruit; stigmas fimbriate; fruit a small 3-quetrous nutlet . . . . . 2. RUMEX.

### 1. POLYGONUM, Linn.; Fl. Brit. Ind. v, 23.

Herbs or shrubs, rarely climbing. *Leaves* alternate, entire, rarely toothed lobed; stipules tubular, membranous. *Flowers* 2-sexual, small or minute, axillary or terminal, clustered, the clusters sessile or in spiciform capitate or paniced racemes; pedicels short, usually jointed under the perianth, bracts and bracteoles membranous, ochreate. *Perianth* green or coloured, 4-5 (rarely 3)-cleft, the 2 outer lobes usually smallest. *Stamens* 5-8 (rarely 1-4), perigynous; filaments often dilated at the base or alternate with the lobes of an annular or glandular disk. *Ovary* compressed or 3-gonous; styles 2 or 3, free or slightly connate, stigmas usually capitellate. *Fruit* a compressed or 3-gonous nutlet, covered or partially so by the persistent perianth; pericarp usually hard and often shining. *Seed* with the embryo lateral or excentric, radicle long, cotyledons small.—Species about 150, throughout the world, but chiefly in temperate regions.

Of the 79 species now known to occur within the area of British India, 45 are restricted to the Himalayan and the North-West Frontier regions; and of the remaining 34 species, fourteen are here included as inhabiting the Upper Gangetic Plain. The very useful "Census of the Indian Polygonums" prepared by Major Gage in 1903 as a contribution to Vol. II of the "Records of the Botanical Survey of India" has been freely made use of by the present writer.

Inflorescence in axillary clusters.—Annual or perennial herbs with small leaves and hyaline stipules . . . . . 1. *P. plebejum* and vars.

Inflorescence terminal, racemose spicate or capitate :—

Inflorescence in elongate stout or filiform racemes or spikes :—

Nutlets biconvex :—

Bracts hairy :—

Bracts coarsely hairy or strigose :—

Leaves ovate, petioles 1-4 in. long . . . 2. *P. orientale*.

Leaves lanceolate, petioles less than  $\frac{1}{2}$  in. long . . . 3. *P. limbatum*.

Bracts densely hite-woolly . . . 4. *P. lanigerum*.

Bracts glabrous :—

Perianth not glandular, ochreae usually eciliate . . . 5. *P. glabrum*.

Perianth glandular, ochreae shortly ciliate . . . 6. *P. lapathifolium*.

Nutlets trigonous :—

Racemes stout and short, with closely imbricate bracts, perianth not glandular :—

Bracts more or less hairy . . . 7. *P. stagninum*.

Bracts glabrous :—

Leaves tapering to the acute base, marginal cilia of ochreae longer than the tube . . . 8. *P. barbatum*.

Leaves tapering to a rounded or subcordate base, marginal cilia of ochreae not longer than the tube . . . 9. *P. serrulatum*.

Racemes slender, filiform, bracts more or less distant :—

Perianth glandular; stems shortly creeping below; nutlets not polished :—

Ochreae very shortly ciliate or eciliate; bracts glandular or not . . . 10. *P. Hydropiper*.

Ochreae with cilia at least half as long as the tube; bracts always glandular . . . 11. *P. flaccidum*.

Perianth not glandular, very small; stems extensively creeping below; nutlets polished . . .

12. *P. Posumbu*.

Inflorescence capitate, compressed :—

Heads with an involucreal leaf at the  
base . . . . . 13. *P. alatum*.

Heads without an involucreal leaf at the  
base . . . . . 14. *P. capitatum*.

1. *P. plebejum*, R. Br. Prod. 420 ; F. B. I. v, 27 : Watt E. D. ; Collett Fl. Siml. 421 ; Gage in Rec. Bot. Surv. Ind. ii, 383 ; Prain Beng. Pl. 885 ; Cooke Fl. Bomb. ii, 512. *P. aviculare*, Don Prod. 72 (not of Linn.). *P. herniarioides*, Del. ; Royle Ill. 313.

A prostrate diffusely branched herb, often with a woody rootstock ; branches stout or slender, terete, striate, glabrous ; lower internodes often longer than the leaves, upper shorter or very short. Leaves sessile or shortly stalked,  $\frac{1}{4}$ – $\frac{3}{8}$  in. long, oblong or linear or obovate ; stipules hyaline, rather short, lacerate to the middle and fimbriate, nerves usually obscure. Flowers axillary, solitary or 2-3-nate, sessile or nearly so. Perianth pink, about  $\frac{1}{10}$  in. long, divided nearly to the base ; segments short, broad, rounded or the 2 outer ones acute. Nutlets 3-gonous, shining.

Throughout Trop. India, ascending to 6,000 ft. on the Himalaya from Bhutan to Kashmir, but not in Ceylon. Beyond India it extends to Afghanistan, Egypt, Trop. and S. Africa, Madagascar, Java, Philippines, and Australia. Regarding this very variable species Sir Joseph Hooker remarks that, if he was right in bringing all the ten varieties (or forms) described by him in the Fl. Brit. India under one species, this is a far more protean plant than *P. aviculare* with which it is generally compared, but from which it differs entirely in habit, in the usually few-nerved stipules and in the rhombic smooth nutlet. *P. aviculare* is abundant on the W. Himalaya and in W. Tibet. Major Gage, after a careful and detailed examination of the many specimens included in the Calcutta Herbarium, as forms or varieties of *P. plebejum*, enumerates 8 varieties in his census. At the same time he is very much inclined to regard them as representing 4 distinct species, and that they might be grouped as follows :—

- |     |                    |      |             |
|-----|--------------------|------|-------------|
| I { | plebejum (proper). | II { | indica.     |
|     | effusa.            |      | brevifolia. |
|     | elegans.           | III. | Griffithii. |
|     | micranthema.       | IV.  | polyneura.  |



He draws attention also to the fact that, apart from morphological considerations, the altitudinal distribution of the constituents, as given in his census, tends to support this view. Of the eight varieties therein mentioned, and which may be regarded for the present as belonging to a single species, all except *polyneura* appear to have been recorded as growing within the limits of this flora. The descriptions are mainly Hooker's, taken from the Fl. Brit. India.

VAR. 1. PLEBEJUM (proper).—Branches stout or slender. Lower internodes often longer than the leaves, upper shorter or very short. *Leaves*  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; upper often much shorter, oblong or linear, obtuse, margins often recurved. *Flowers* sunk amongst the stipules, rarely exserted. *Sepals* short, broad, rounded.—Dehra Dun, Lucknow, Bundelkhand. DISTRIB.: Common from Assam to N. W. India and on the outer Himalayan ranges; found also in N. Kanara and extending to Africa and Australia.

VAR. 2. EFFUSA.—A slender rather flaccid plant with long internodes. *Leaves* narrowly linear or widening upwards from a very narrow base, tip rounded. *Flowers* all or mostly pedicelled. *Sepals* short, broad.—Dehra Dun (King), N. W. India (Royle), Merwara (Duthie). DISTRIB.: Bengal to Bombay and Sind. *P. effusum*, Meissn. Herb. Strach. and Winterb. No. 22. Usually in wet places.

VAR. 3. ELEGANS.—Black when dry. Branches stout, grooved, smooth or scaberulous; internodes longer or shorter than the leaves. *Leaves*  $\frac{1}{2}$ – $\frac{3}{4}$  in. long; upper as long as the lower, linear-lanceolate, acute or acuminate, rarely obtuse, margins flat or revolute; stipules fimbriate, brownish. *Flowers* sessile or shortly pedicelled. *Sepals* narrow, the two outer acute.—Sub-Himalayan tracts of Rohilkhand and N. Oudh (Wallich, Duthie), Saugor (Vicary). DISTRIB.: Bengal, Nepal, Assam and Tenasserim, extending to Australia. *P. elegans*, Roxb.; Fl. Ind. ii, 291. Hooker describes this as a large form passing into *plebejum* (proper) by insensible transitions. It is also *P. prostratum* of Roxb. l.c.

VAR. 4. MICRANTHEMA.—A small plant with slender branches. *Leaves*  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, linear or linear-oblong, obtuse at the apex and narrowed towards the base; upper crowded, as long as the often distant lower, stipules short. *Flowers* very minute, pedicelled, crowded in the upper axils. *Sepals* narrow, obtuse. *Nutlets* minute,  $\frac{1}{10}$ – $\frac{1}{12}$  in. in diam.—Dehra Dun (King), Siwalik range and N. Oudh (Duthie). DISTRIB.: Bengal in sandy river beds, also in Sind. Hooker regards this as only a small state of *P. plebejum*, into which it passes by in



sensible gradations. Cooke Fl. Bomb. ii, 514. *P. micranthemum* Franchet.

VAR. 5. INDICA.—Branches uniformly spreading all round from the crown and leafy, internodes short. *Leaves*  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, linear or obovate-oblong, flat, obtuse or apiculate; stipules very short. *Flowers* crowded in the axils, pedicels shorter than the perianth or none. *Sepals* broad, 2 outer acute. *Nutlets*  $\frac{1}{4}$  in.—Saugor (Jerdon).  
DISTRIB.: Common in Central and S. India, also in the Bombay Pres., extending to Africa and Australia. Watt E. D.; Cooke Fl. Bomb. ii, 513. *P. indicum*, Heyne.

VAR. 6. BREVI-FOLIA.—Rootstock woody; branches stout, often 1-2 ft. long, dark-brown, grooved; internodes of branchlets very short, concealed by the leaves and stipules which latter show as a continuous white villous band on the underside of the branchlets. *Leaves*  $\frac{1}{2}$ – $\frac{1}{4}$  in. long, obovate, acute or apiculate, flat, coriaceous, dark-brown when dry. *Flowers* sessile, almost concealed by the stipules. *Sepals* narrow, outer acute. *Nutlets*  $\frac{1}{4}$ – $\frac{1}{2}$  in.—Abundant within the area in dry places. DISTRIB.: Bengal to Garhwal and W. India, also in Burma and extending to Africa. Prain Beng. Pl. 886; Cooke Fl. Bomb. ii, 514. A short form with crowded leaves; allied to *indica*, and differing from *Griffithii* by its stout habit and narrower longer leaves which are less covered by the stipules.

VAR. 7. GRIFFITHII.—Branches excessively numerous from the root, very slender flexuous and quite naked below; branchlets with the internodes so close that they look woolly from the crowded and firm-briate stipules. *Leaves* shorter than the almost nerveless stipules, orbicular or broadly obovate, flat, apiculate. *Flowers* minute, subsessile, hidden amongst the stipules. *Sepals* rounded, the 2 outer apiculate.—N. W. India (Falc.); abundant in the Jumna and Chambal ravines of Agra and Etawah (Duthie), and in Bundelkhand (Duthie) and Saugor (Jerdon). This very distinct-looking plant is considered by Hooker to be probably a modified form of *brevifolia* with the bases of the branches buried in soil and hence almost leafless and very slender.

2. *P. orientale*, Linn. Sp. Pl. 362; F. B. I. v, 30; Collett Fl. Siml. 421; Prain Beng. Pl. 886; Gage in Rec. Bot. Surv. Ind. ii, 386; *P. pilosum*, Roxb. Fl. Ind. ii, 286.

A tall erect branching annual, 3-10 ft. high, usually softly pubescent or silkily villous; stems robust, grooved, branches hollow. *Leaves* 6-9 in. long, ovate or ovate-cordate, acuminate; petioles 1-4 in. long, stipules short, truncate, hirsute, ciliate at the mouth, expanded or

tightly embracing the stem. *Racemes* laxly paniced, cylindric, 3-5 in. long, peduncles stout, erect or drooping; bracts crowded, 3-6 flowered, strigosely tomentose and ciliate. *Flowers* large; perianth white red or green, 4 or 5 partite. *Stamens* 7-8, included. *Styles* connate below, stigmas capitellate. *Nutlets*  $\frac{1}{2}$  in. long, orbicular, compressed, with rounded margins and rather concave faces, black and shining when ripe.

Dehra Dun, in swamps (Falconer, Duthie); Sub-Himalayan tracts of N. Oudh. Flowers during the rainy season. *DISTRIB.*: Himalaya eastwards from Kashmir, ascending to 5,000 ft.; also in Bengal, Assam and Burma; extending to Turkestan, Siam, China, Japan, Java and Borneo. The plant is often cultivated, and in that condition it often becomes almost glabrous.

**3. P. limbatum**, Meissn. in DC. *Prod.* xiv, 123; F. B. I. v, 30; *Prain Beng. Pl.* 886; *Gage in Rec. Bot. Surv. Ind.* ii, 387; *Cooke Fl. Bomb. ii*, 515.

Annual. Stem simple, very stout, erect or prostrate below, pubescent or glabrous. *Leaves* shortly petioled, 4-8 in. long, lanceolate, acuminate, tapering below, scaberulous on both surfaces; stipules cylindric, strigose; mouth truncate, with a spreading or recurved scabrid and ciliate herbaceous limb. *Flowers* in short erect paniced racemes, peduncles strigose; bracts crowded, hispid. *Nutlets*  $\frac{1}{2}$  in. in diam., orbicular, compressed, margins rounded, faces convex.

Saharanpur, Rohilkhand (T. Thomson), N. Oudh (R. Thompson), Bundelkhand (Vicary), Saugor (Jerdon); usually in wet ground. *DISTRIB.*: Garhwal, Bengal, W. and S. India; extending to Egypt and Trop. Africa.

**4. P. lanigerum**, R. Br. *Prod.* 419; *Royle Ill.* 313; F. B. I. v, 35; *Prain Beng. Pl.* 886; *Gage l. c.* 394. *P. lanatum*, Roxb. *Fl. Ind. ii*, 285.

A robust annual (or perhaps sometimes perennial), 2-5 ft. high. *Stem* stout, prostrate below and rooting at the nodes, clothed with snow-white tomentum; branches slender, deep-red within especially at the nodes. *Leaves* shortly stalked, narrowly lanceolate, acuminate, densely white-cottony beneath; stipules membranous, striate; mouth unequally truncate, sparsely ciliate. *Racemes* slender, 1-2 in. long; peduncles spreading, white-tomentose; bracts small, crowded, densely white-woolly. *Perianth* small, white or pink, eglandular. *Stamens* 6. *Style* 2-cleft. *Nutlets* small, orbicular, black and shining.

In ditches and wet places, chiefly in the northern portion of the area, from Dehra Dun eastwards along the Sub-Himalayan tracts. *Flowers* during the rainy season. *DISTRIB.*: Rajputana, and on the outer Himalayan ranges from the Punjab to Sikkim, ascending to 5,000 ft. in Garhwal and Kumaon; also in Bengal, Assam and Burma; and extending to China, Java, the Philippines, Egypt, Trop. and S. Africa, America and N. Australia.

5. *P. glabrum*, Willd. *Sp. Pl.* ii, 447; Roxb. *Fl. Ind.* ii, 287; Royle *Ill.* 313; *F. B. I.* v, 34; Watt *E. D.*; Collett *Fl. Siml.* 422; Prain *Beng. Pl.* 886; Gage *l. c.* 393; Cooke *Fl. Bomb.* ii, 514.

An erect glabrous annual, 2-5 ft. high. *Stems* stout, simple or slightly branched, procumbent below and usually tinged with red. *Leaves* 3-9 in. long, lanceolate, acuminate, tapering at the base, glabrous and usually gland-dotted, lateral nerves close; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in.; stipules 1-1 $\frac{1}{2}$  in. long, closely embracing the stems when young, veins conspicuous, mouth truncate, ciliate. *Racemes* erect, slender, 2-4 in. long, forming a terminal panicle, peduncles usually glabrous; bracts glabrous,  $\frac{1}{2}$  in. long, ovate, obtuse; margins membranous, rarely ciliate. *Perianth*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, pink or white, not glandular; segments ovate-oblong, obtuse. *Stamens* 6-8. *Styles* 2, rarely 3, connate below. *Nutlets*  $\frac{1}{2}$  in. in diam., sub-orbicular and biconvex, or 3-angled in the 3-styled flowers.

Abundant in all parts of the area in swamps and by streams. *DISTRIB.*: Throughout the greater part of India in wet places, ascending to 6,000 ft. on the Himalaya, also in Ceylon. It is found also in China, Australia, Africa and America. Hooker (in *F.B.I.*, l. c.) notes that it is difficult to separate this species from smooth forms of *P. Persicaria*, of which it may be regarded as the tropical representative in India. It is, however, as he says, a much larger plant, less branched and with more attenuate leaves, which turn brown when drying; also in normal specimens the stipules and bracts are ciliate. The pungent leaves and young shoots are cooked by the natives in certain parts of India and eaten as an adjunct to other vegetables.

6. *P. lapathifolium*, Linn. *Sp. Pl.* 360; *F. B. I.* v, 35 (var. *laxa*); Gage *l. c.* 395; Prain *Beng. Pl.* 886; Duthie in Strachey *Cat. Pl. Kumaon* (1906) 258. *P. laxum*, Reichb. *P. nutans*, Roxb. *Fl. Ind.* ii, 285. *P. similense*, Royle ex Bab. in *Trans. Linn. Soc.* xviii (1841), 102; Collett *Fl. Siml.* 422 (in part). *P. quadrifidum*, Herb. *S. and W.* No. 24).

An erect branching usually pale-green annual. *Stems* often tinged with red. *Leaves* subsessile, elliptic-ovate or lanceolate, glandular beneath; stipules usually shortly ciliate. *Racemes* erect or nodding, dense or (in Indian specimens) rather lax; bracts ciliate, peduncles and pedicels glandular. *Perianth* greenish, glandular, nerves strong. *Stamens* usually 6. *Nutlets* orbicular, biconvex.

Collected by Dr. T. Thomson in the Moradabad District. This is the only authentic record I have seen of its occurrence within the area of this flora, though doubtless existing in other localities. **DISTRIB.**: From Bengal to the N. W. Frontier, ascending to 5,000 ft. on the Himalaya; also in Assam and Burma. This is the var. *laxa* of the Fl. Brit. Ind., distinguished from the type by its cylindric and more lax racemes.

**7. *P. stagninum*, Buch.-Ham. ex Meissn. in Wall. Pl. As. Rar. iii, 56; F. B. I. v, 37; Prain Beng. Pl. 887; Gage in Rec. Bot. Surv. Ind. ii, 397.**

A simple or branched annual. *Stems* erect or ascending, eglandular. *Leaves* 3-5 in. long, lanceolate or linear-lanceolate, strigosely pubescent on both surfaces, often glandular beneath, usually silky when young, turning grey when dry; stipules strigose, cilia shorter than the tube. *Racemes* erect, many-flowered; peduncles usually long and stout, sub-silkily strigose; bracts close, more or less hairy and ciliate on the margins. *Perianth* white, eglandular. *Styles* long connate below. *Nutlets* 3-gonous, pitchy black.

In wet places in the Sub-Himalayan tracts from Dehra Dun to N. Oudh. **DISTRIB.**: Himalayan outer ranges from the Punjab to Sikkim; also in Bengal, Assam and Burma. This plant is so closely related to *P. barbatum* that, apart from certain differences in regard to pubescence, characters which are not invariably constant, the two might well be united under one species, treating *P. stagninum* as a variety of *P. barbatum*, as already suggested by Sir Joseph Hooker and Major Gage.

**8. *P. barbatum*, Linn. Sp. Pl. 362; Royle Ill. 313; F. B. I. v. 37; Watt E. D.; Prain Beng. Pl. 887; Gage l. c. 397. *P. rivulare*, Koen. ; Roxb. Fl. Ind. ii, 290.**

A stout annual. *Stems* erect, glabrous or nearly so. *Leaves* 4-7 in. long, lanceolate or linear-lanceolate, acuminate, tapering to the acute base, glabrous except the ciliate margins and midrib beneath; stipules strigose, the mouth with cilia which exceed the length of the tube.

Peduncles quite glabrous. *Racemes* erect, slender, weak, 2-4 in. long; bracts crowded, glabrous, margins sparingly and shortly ciliate. *Perianth* white, eglandular. *Stamens* 5-8. *Styles* 3-cleft. *Nutlets* trigonous.

Common within the area usually in wet places. **DISTRIB.** : Hotter parts of India from Assam and Bengal to the N. W. Frontier, and from the Cent. Prov. to S. India and Ceylon; also in Burma extending to the Malay Peninsula, China, Japan, Trop. Africa and Australia. This species differs from *P. serrulatum* by the acute base of the leaves and by the much longer bristles of the stipules; the leaves also turn brown when drying. Watt mentions that in China and Japan this plant yields a blue dye similar to that of indigo.

**9. *P. serrulatum***, Lagasc. *Gen. and Sp. Pl.* 14; *F. B. I. v.* 38; *Prain Beng. Pl.* 887; *Gage l. c.* 399; *Cooke Fl. Bomb. ii.* 515. *P. flaccidum*, Roxb. *Fl. Ind. ii.* 291 (not of Meissn. or Boiss).—Vern. *Pánimirsch*.

An annual. *Stems* prostrate and rooting below; branches 2-4 ft. high, glabrous, often reddish. *Leaves* subsessile, drying green, 2-5 in. long, linear or elliptic-oblong, acute or acuminate, glabrous or sparsely hairy on upper surface and midrib; base rounded or cordate; stipules strigose; mouth truncate, with bristles on the margin nearly as long as the tube. *Racemes* paniced, slender, erect,  $\frac{1}{2}$ -2 in. long; bracts glabrous, strongly and often squarrosely ciliate. *Perianth* white,  $\frac{1}{10}$  in. long, eglandular. *Stamens* 5-8. *Styles* 3, connate below. *Nutlets* trigonous,  $\frac{1}{12}$  in. long, polished.

Common within the area in swamps and by river-banks. **DISTRIB.** : From Assam and Bengal to the Indus, ascending to 7,000 ft. on the W. Himalaya; also in Central and S. India and in Ceylon; extending to Burma, China, the Malay Pen., W. Asia, S. Eur., Africa, America and Australia.

**10. *P. Hydropiper***, Linn. *Sp. Pl.* 361; *Royle Ill.* 317; *F. B. I. v.* 39; *Watt E. D.*; *Collett Fl. Siml.* 423; *Prain Beng. Pl.* 887; *Gage l. c.* 401.—Water-pepper.

A rather robust glabrous annual. *Stems* much-branched, minutely glandular, 12-18 in. high, swollen at the joints, prostrate and rooting at the lower nodes. *Leaves* shortly stalked, rarely more than 3 in. long, lanceolate or oblong-lanceolate, variable in width and in the length of the apical portion, usually covered with impressed glands glabrous or with the midrib scabrid beneath; stipules glabrous or

sparsely strigose with hairs that are sunk in the tissue, very shortly ciliate or eciliate. *Racemes* decurved, filiform, flexuous, leafy at the base; bracts more or less interrupted, glabrous, glandular or not; mouth naked or minutely ciliate. *Perianth* pink, very glandular. *Nutlets* usually trigonous, opaque, granulate.

In wet places, chiefly in the northern portion of the area, from Dehra Dun and Rohilkhand eastwards. *DISTRIB.* : From Assam and Bengal to the N. W. Frontier, ascending to 7,000 ft. on the Himalaya, also on the Khasia Hills; extending to Europe, N. Africa, Java, N. America and Australia. The fresh plant contains an acrid juice, which is used as a powerful diuretic.

**11. *P. flaccidum*, Meissn. in DC. Prod. xiv, 107 in part, excl. syn. (not of Roxburgh); F. B. I. v, 39; Prain Beng. Pl. 887; Gage l. c. 402. P. tenellum. Roxb. Fl. Ind. ii, 289.**

A glabrous or pubescent annual or perennial. *Root* shortly creeping. *Stems* 2-3 ft. high, slender, shortly creeping below, simple or branched. *Leaves* usually stalked, 2-6 in. long, lanceolate or elliptic-lanceolate, acuminate, quite glabrous except sometimes on the midrib and nerves beneath, or strigosely hairy beneath or on both surfaces, more or less glandular, brown when dry; stipules strigose or hirsute, marginal cilia half as long as the tube or longer. *Racemes* subpaniculate, sometimes 6 in. long and very slender; bracts usually very distant, glabrous or more or less ciliate, glandular or not. *Perianth* bright-pink or white (Roxburgh) closely glandular. *Stamens* 8. *Nutlets* small, trigonous, dull-black, minutely rugose.

In wet ground, Upper Gangetic Plain (T. Thomson), Dehra Dun (King). Flowers during the rainy season. *DISTRIB.* : Throughout India in wet places, ascending to 6,000 ft. on the Kumaon Himalaya; also in Ceylon, Malay Pen. and Islands and China.

**12. *P. Posumbu*, Buch.-Ham. in Don. Prod. 71 (not of Wallich); F. B. I. v, 38; Gage l. c. 425.**

A very slender flaccid perennial herb. *Stems* extensively creeping then ascending or decumbent. *Leaves* petioled, membranous, 1-3 in. long, elliptic-lanceolate, caudate-acuminate, glabrous or sparsely hairy; stipules slightly strigose; cilia stiff, longer than the tube. *Racemes* erect, filiform, 1-3 in. or longer; bracts minute, imbricate or distant, very shortly ciliate. *Perianth* very small, eglandular. *Nutlets* smooth and polished.

Dehra Dun (King). **DISTRIB.**: Sub-tropical and temperate Himalaya from Kashmir to Sikkim ascending to 9,000 ft.; also in Assam and on the Khasia Hills, extending to Java, China and Japan.

**13. P. alatum**, *Buch.-Ham. in Don. Prod.* 72; *F. B. I. v.* 41; *Watt E. D.*; *Prairie Beng. Pl.* 887; *Collett Fl. Siml.* 423 (in part); *Gage l. c.* 404; *Cooke Fl. Bomb. ii.* 516. *P. punctatum*, *Buch.-Ham. l. c.*; *Trimen Fl. Ceyl. iii.* 413. *P. nepalense*, *Meissn.* —

A procumbent glabrous or sparsely hairy annual. *Stems* 1-2 ft. long, rooting at the nodes; branches many, ascending. *Leaves*  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, deltoid-ovate, acute or subobtuse, entire, minutely punctate; base subtruncate or subcordate, shortly cuneate; petioles winged, amplexicaul at the base; stipules membranous, obliquely truncate, ciliate but with a tuft of hairs at the base. *Flowers* in compressed peduncled heads, with an involucre leaf at the base of each head; peduncles glandular-hairy above; bracts membranous,  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long, ciliate. *Perianth*  $\frac{1}{2}$  in. long, 4 fid. *Nutlets*  $\frac{1}{12}$  in. long, broadly ovoid, compressed, usually biconvex, black and minutely pitted.

Dehra Dun (Duthie). *Flowers* during the rainy season, **DISTRIB.**: Abundant on the Himalaya up to 10,000 ft., Parasnath in Bengal also in Assam, Burma and on the hills of W. and S. India, extending to Ceylon, China, Afghanistan and Africa. The above description refers to var. *nepalensis* of Hook. f. *F. B. I. v.* 42.

**14. P. capitatum**, *Buch.-Ham. ex. Don. Prod.* 73; *F. B. I. v.* 44; *Collett Fl. Siml.* 423, fig. 134; *Gage l. c.* 428.

A perennial herb. *Stems* many, leafy, 6-10 in. long, creeping from a stout woody usually twisted rootstock, usually reddish and clothed with brown hairs. *Leaves* crowded, bifarious, shortly stalked,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, ovate-elliptic, acute, downy on both surfaces, rather thick, eglandular, turning brown when dry; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in., with 2 small rounded glandular hispid auricles at the base. *Inflorescence* capitate; heads  $\frac{1}{4}$ - $\frac{3}{4}$  in. in diam., dense-flowered, glandular and hairy; peduncles often glandular-hispid; involucre leaf none; bracts flat, ovate, acute, ciliate, glabrous. *Perianth* pink, 5-cleft, segments obtuse. *Stamens* 8. *Nutlets* 3-gonous,  $\frac{1}{16}$  in. long.

Dehra Dun, in crevices of rocks in many of the ravines (Duthie). Probably in other localities in Sub-Himalayan tracts eastwards. **DISTRIB.**: Sub-tropical and temperate Himalaya, up to 6,000 ft.; also on the Khasia hills and extending to China.



2. **RUMEX**, Linn. ; Fl. Brit. Ind. v, 58.

Perennial or annual herbs, rarely shrubs. *Leaves* mostly radical or cauline, alternate; stipules hyaline ochreate, often disappearing with age. *Flowers* 2-sexual or moncecious, in axillary clusters or in whorls arranged in simple or paniced racemes. *Perianth-segments* 6, rarely 4; inner accrescent, entire or toothed, midrib often enlarged or tubercled. *Stamens* 6, filaments short, anthers oblong. *Ovary* 3-gonous, styles 3, stigmas fimbriate. *Fruit* a small nut, enclosed in the usually enlarged inner perianth-segments, angles acute. *Seed* erect, embryo lateral, nearly straight, cotyledons linear or oblong.—Species about 140, in all temperate and in many tropical regions.

Flowers 2-sexual; inner fruiting sepals coriaceous;  
styles terminal; leaves never hastate :—

Inner fruiting sepals with narrow margins and  
few or no teeth :—

Leaves gradually narrowed into the petioles,  
tips usually acute; flowers distinctly  
stalked; inner fruiting sepals brownish-  
yellow . . . . . (*R. maritimus*).

Leaves cordate at the base and with a contrac-  
tion just above it, tips always obtuse;  
flowers shortly stalked; inner fruiting sepals  
much longer and almost black . . . . . 1. *R. nigricans*.

Inner fruiting sepals with wide much-toothed  
wings :—

Teeth of wings not hooked . . . . . 2. *R. dentatus*.

Teeth of wings usually hooked . . . . . 3. *R. nepalensis*.

Flowers 1-sexual or polygamous; inner fruiting  
sepals membranous; styles from the angles  
of the ovary; leaves hastate . . . . . (*R. hastatus*).

1. **R. nigricans**, Hook, f. in *F. B. I.* v, 59; *Prain Beng. Pl.* 888.

An erect annual,  $\frac{1}{2}$ –1½ ft. high. *Leaves* linear-oblong, obtuse, contracted above the cordate base, margins often waved or crisped. Flowering branches rigid, spreading, with or without leaves. *Flowers* shortly pedicelled, densely crowded in globose distant whorls or confluent heads. *Perianth* enlarging in fruit, nearly black; inner sepals large

and with a conspicuous oblong dark-coloured tubercle on the back : tips acute ; margins very narrow, entire or with one or two short straight teeth or spines. *Styles* terminal.

Edges of tanks near Banda in Bundelkhand (Mrs. Bell). **DISTRIB.** : Bengal, Behar, Khasia Hills and in the Deccan Peninsula. This species is very similar to the European *R. conglomeratus*, but the leaf is panduriform, and the tips of the valves are acute.

**2. R. dentatus**, Linn. Mant. ii, 226 ; Royle Ill. 313 ; F. B. I. v, 59 ; Watt E. D. ; Prain Beng. Pl. 889 ; Cooke Fl. Bomb. ii, 518.

An erect annual, 1-2 ft. high. *Stems* grooved, glabrous, usually tinged with red. *Leaves* 3-4 in. long, oblong, obtuse, glabrous, base rounded or cordate, petioles of radical leaves up to  $2\frac{1}{2}$  in. long. *Flowers* shortly pedicelled, 2-sexual, arranged in distinct leafy or leafless whorls. *Perianth*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long ; inner segments broadly ovate, reticulate-veined, much enlarged in fruit and with an ovoid-oblong smooth tubercle on its back, margins irregularly toothed or pectinate ; the teeth numerous, short, straight, not hooked. *Nuts*  $\frac{1}{10}$  in. long, acutely 3-gonous or almost winged.

N. W. India (Royle), Dehra Dun (King), Sub-Himalayan tracts of N. Oudh and Gorakhpur (R. Thompson and Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell). **DISTRIB.** : From Bengal and Assam to W. and S. India ; also on the Himalaya up to 1,000 ft. in Kumaon and extending to China. Hooker alludes to a specimen from Oudh in which the inner segments of the perianth are very narrowly winged, thus showing a transition to *R. nigricans*. The roots yield a dye which is said to be used in Sind.

**3. R. nepalensis**, Spreng. Syst. ii, 159 ; F. B. I. v, 60 ; Collett Fl. Siml. 428.

Annual or occasionally perennial. Root sometimes with tuberous fibres (Boiss.) *Stems* stout, erect, 2-4 ft. high, branched. *Leaves* at the base of the stems up to 14 in. long, oblong or triangular-ovate, acute or obtuse, base cordate, petioles very slender ; upper leaves sessile or nearly so, narrowed to the base. *Whorls* distant, on elongate nearly leafless racemes. *Fruiting sepals* orbicular-ovate, broadly winged, one or more with an oblong tubercle on the back, wing pectinately toothed and strongly reticulate, teeth usually with hooked tips.

Dehra Dun (King), and in the Sub-Himalayan tracts of N. Oudh and Gorakhpur (Duthie). **DISTRIB.** : Temp. Himalaya from Bhutan to

Kashmir, up to 9,000 ft. or more; also on the hills of W. and S. India and extending to W. Asia and S. Africa. Its habit is that of *R. obtusifolius*, a common European species.

- R. MARITIMUS*, Linn.; *F. B. I. v.* 59; *Watt E. D.*; *Prain Beng. Pl.* 888.—There is a record of this plant having been found by Mr. A. O. Hume in marshes by the banks of the Jumna near Etawah. There are, however, no specimens at Kew from the area of this flora. As the plant appears to be fairly abundant in Bengal its occurrence within the eastern border of the Upper Gangetic Plain may be regarded as probable. I have therefore included it in the clavis where its distinguishing characters will be found. It occurs also in Assam and in the Central Provinces, and extends to N. Africa, Europe and in N. and S. America.
- R. HASTATUS*, *Don Prod.* 74; *Royle Ill.* 314; *F. B. I. v.* 60; *Watt E. D.*; *Brandis Ind. Trees* 521; *Collett Fl. Siml.* 428, fig. 136; *Gamble Man. Ind. Timb.* 553. Vern. *Chulmora* (Kumaon).—A somewhat glaucous perennial herb or small shrub, 1-2 ft. high. *Rootstock* woody. *Leaves* 1-2½ in. long, broadly triangular or hastately 3-lobed. *Flowers* minute, polygamous, pedicels lengthening in fruit. Inner enlarged sepals ¼-½ in. in diam., orbicular, notched at both ends, usually bright pink and very delicately veined.—Found occasionally in Dehra Dun at the base of the Himalaya. It is a common plant, on the W. Himalaya, ascending to 8,000 ft. and is found usually on exposed rocks and dry stony hillsides. The hill-station of Almora in Kumaon is said to have been so-called by reason of the abundance of this plant in that neighbourhood. The leaves are very acid and may be eaten as salad.
- R. VESICARIUS*, Linn.; *Roxb. Fl. Ind.* ii, 209; *F. B. I. v.* 61; *Duthie Field and Gard. Crops* iii, 45; *Watt E. D.*; *Collett Fl. Siml.* 428; *Prain Beng. Pl.* 889. Vern. *Chuka-sák*. A pale-green rather fleshy glabrous annual. *Leaves* ovate. *Flowers* moncecious. Fruiting sepals ½ in. across, orbicular, hyaline.—Cultivated in many parts of India as a vegetable. It is found wild on the hills of the W. Punjab, also in Afghanistan, Persia, the Levant and in N. Africa.
- CALLIGONUM POLYGONOIDES*, Linn.; *Brandis For. Fl.* 372; *Ind. Trees* 520; *F. B. I. v.* 22; *Watt E. D.* *Gamble Man.* 552; *Cooke Fl. Bomb.* ii, 510. Vern. *Phog, phok*.—An almost leafless shrub or small tree found within the arid districts of N.-W. India on both sides of the Indus, extending as far north as Lahore and eastwards to Bikanir, often gregarious. It is found also in Sind, and beyond India in Persia, Armenia and Syria. During the hot season the bushes are covered with the fragrant pinkish flowers which after falling are

swept up by the country people and eaten cooked. The fruit is densely setose. I have seen no specimens from the area included in this flora.

*FAGOPYRUM ESCULENTUM*, Mærch; Don *Prod.* 73; Royle *Ill.* 317; *F. B. I.* v, 55. Watt *E. D.*; DC. *L'Orig. Pl. Cult.* 279; Duthie *Field and Gard. Crops N. W. Prov. and Oudh iii*, 25, t. 83. Vern. *Pháphra, kulti, ogla.* (*Buckwheat*).—An erect glabrous annual 1-3 ft. high. *Leaves* triangular-cordate, acute. *Flowers* white or pink, in terminal subcapitate cymes. *Nuts* trigonous, acutely angled.—Much cultivated for its grain in Dehra Dun and in the Sub-Himalayan tracts eastwards, as well as in the hilly districts of Central and S. India; also extensively on the Himalayan ranges and up to 12,000 ft. in W. Tibet. Another species, known as *F. tataricum*, and distinguished by having the angles of the nuts blunt, is a much taller and coarser plant, and is usually restricted to the Himalaya and at rather higher elevations. It is much cultivated by the inhabitants of the higher villages.

*ANTIGONUM LEPTOPUS*, Hook. and Arn.; Gamble *Man.* 552; Prain *Beng. Pl.* 889; Cooke *Fl. Bomb. ii*, 519. The Coral Creeper.—A large handsome climbing shrub with bright pink flowers. It is a native of S. America, and is largely grown in the gardens of N. India.

*MUEHLENBECKIA PLATYCLADOS*, Meissn. (*Cocoloba platyclada*, F. Muell.).—A quaint-looking glabrous shrub with flattened leaf-like branches (phylloclades) is often grown in the gardens of Upper India. It is a native of the Solomon Islands.

### XCIH.—ARISTOLOCHIACEÆ.

Herbs or shrubs, often climbing, usually more or less foetid. *Leaves* alternate, entire or lobed; stipules none. *Flowers* 2-sexual, often large, usually lurid, terminal axillary or lateral, solitary racemose or cymose, with or without bracts. *Perianth* simple, more or less adnate below to the ovary, regular or irregular, 3-lobed or tubular, lobes valvate. *Stamens* 6 or more, adnate in 1 or 2 series to the top of the ovary or round the style; anthers erect; cells parallel, dehiscing dorsally. *Ovary* 4-6-celled; placentas parietal, free or extending to the axis; style columnar, stigma lobed; ovules many, anatropous. *Fruit* a capsule or berry. *Seeds* many; albumen copious, fleshy, embryo minute.—Species about 200, chiefly tropical.

## ARISTOLOCHIA, Linn. ; Fl. Brit. Ind. v, 74.

Shrubs or perennial herbs, often twining. *Leaves* with the petioles dilated at the base, and often with a stipule-like leaf of an undeveloped bud in the axil. *Perianth* coloured, tube inflated below, then contracted, hairy within; limb dilated, oblique, usually 2-lipped. *Stamens* 6, rarely 5 or more than 6; adnate in 1 series above the ovary, filaments or connectives not distinguishable from the style; anthers adnate to the column, dehiscing extrorsely. *Ovary* inferior, more or less perfectly 6-celled, rarely 5- or 4-celled, style or column short and thick, divided above into 3 or 6 (rarely more) obtuse or linear lobes, ovules 2-seriate. *Fruit* a capsule, lantern-like, septically 6 (rarely 5) -valved, or splitting through the placentas. *Seeds* horizontal, often covered by the remains of the placenta.—Species about 180, chiefly tropical.

*A. bracteata*, Retz. *Obs. Bot. fasc. v, 29*; Roxb. *Fl. Ind. iii, 490*; Royle *III. 330*; *F. B. I. v, 75*; Watt *E. D.*; Prain *Beng. Pl. 890*; Cooke *Fl. Bomb. ii, 524*.—Vern. *Kiramar*.

A slender decumbent glabrous perennial herb. *Stems* 12-18 in. long, weak, prostrate; branches striate, glabrous. *Leaves*  $1\frac{1}{2}$ -3 in. long and broad, reniform or broadly ovate, usually widely and shallowly cordate at the base, glaucous beneath, finely reticulate-veined, glabrous; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. *Flowers* solitary; pedicels with a large sessile orbicular or subreniform bract at or near the base. *Perianth* 1-1 $\frac{1}{2}$  in. long, base subglobose; tube cylindric, with a trumpet-shaped mouth, villous inside with purple hairs; lip as long as the tube, linear, dark-purple, margins revolute. *Capsule*  $\frac{3}{4}$ -1 in. long, oblong-ellipsoid, 12-ribbed, glabrous. *Seeds*  $\frac{1}{4}$  in. long, triangular with a cordate base.

Banks of Jumna and Ganges (Royle), Bundelkhand (Edgeworth), Gwalior (Mariès). Flowers at the end of the rainy season. *DISTRIB.*: Bengal, W. and S. India and in Ceylon, extending to Arabia and Tropical Africa. The whole plant is intensely bitter, and it is much used by Hindu doctors for its purgative and anthelmintic properties.

*A. INDICA*, Linn.; Roxb. *Fl. Ind. iii, 489*; Royle *III. 330*; *F. B. I. v, 75*; Watt *E. D.*; Prain *Beng. Pl. 891*; Cooke *Fl. Bomb. ii, 594*; Brandis *Ind. Trees 522*. (Indian Birthwort).—A climbing perennial herb with the under surface of the leaves green. It occurs in Nepal and over the greater part of Bengal, also in W. and S. India, and in Ceylon.

It is found in gardens within the area of this flora, and the very bitter roots, like those of *A. bracteata*, are used medicinally. Several exotic species are grown in Indian gardens as ornamental plants, notably some from Brazil with curious and highly coloured flowers.

#### XCIV.—PIPERACEÆ.

Herbs or shrubs, usually aromatic. *Leaves* alternate opposite or whorled, entire, gland-dotted; stipules none or 2, connate or adnate to the petiole. *Flowers* minute, 1- or 2-sexual, in axillary or terminal catkin-like spikes, subtended by a peltate bract. *Perianth* none. *Stamens* 2-6, rarely 7-8, hypogynous; anthers often jointed on the filaments, the cells sometimes confluent and bursting longitudinally. *Ovary* of 3 or 4 carpels free or connate at the base, each with many ovules, or ovary 1-celled with a solitary orthotropous ovule; stigmas distinct on the free carpels or ovary-lobes, or terminal on the undivided ovary, occasionally solitary, sessile, simple or penicillate. *Fruit* small, indehiscent, or of cocci or follicles. *Seeds* globose, ovoid or oblong, testa thin; albumen copious, floury, embryo enclosed in an amniotic cavity at the end of the albumen remote from the hilum, cotyledons minute or obsolete, radicle superior.—Species over 1,000, in tropical and sub-tropical regions, chiefly American.

Flowers 2-sexual; ovary of 3 or 4 free or connate  
carpels . . . . .

1. HOULTUYNIA.

Flowers usually dioecious; ovary 1-celled . . . . .

2. PIPER.

#### 1. HOULTUYNIA, Thunb.; Fl. Brit. Ind. v, 78.

Perennial herbs. *Leaves* alternate, usually cordate; stipules broad, membranous. *Spikes* terminal and leaf-opposed, peduncled, dense, usually with an involucre of 4-6 white petaloid bracts. *Flowers* minute. *Perianth* none. *Stamens* 3-6, filaments adnate at the base to the ovary, anthers oblong. *Ovary* of 3-4 partially connate 1-celled carpels; styles free, erect, stigmatose on the inner surface; ovules many, on parietal placentas. *Fruit* subglobose, bursting between the styles. *Seeds* many, globose, testa membran-



ous.—Species 2, one in N. W. America and the other Indian, extending to Siam, China and Japan.

**H. cordata**, Thunb. *Fl. Jap.* 214, t. 26; *Royle Ill.* 331; *F. B. I. v.* 78; *Kanjilal For. Fl. ed. 2.* 324; *Collett Fl. Siml.* 429.

A perennial herb with a creeping rootstock. *Stem* erect, 1-3 ft. high, leafy, angular, herbaceous, pubescent at the nodes. *Leaves* cauline,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long and broad, broadly ovate-cordate, acuminate, 5-nerved, abruptly narrowed into the petiole, glabrous or with the nerves pubescent beneath, gland-dotted; petiole 1-2 in.; stipules membranous, linear-oblong, obtuse, emarginate or bifid, adnate to the channelled petiole, ciliate on the margins. *Spikes*  $\frac{1}{2}$  in. long, dense-flowered, elongating in fruit; bracts  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, rounded or oblong. *Stamens* 3.

Sub-Himalayan tracts in N. Oudh (Duthie). **DISTRIB.** : Trop. Himalaya from the Punjab to Sikkim, up to 5,000 ft.; also Assam, the Khasia Mts. and Ceylon, extending to China and Japan.

## 2. PIPER, Linn.; *Fl. Brit. Ind.* v, 78.

Shrubs, rarely herbs, erect or scandent, often glandular and aromatic, branches with swollen nodes. *Leaves* usually entire and often oblique, stipules various. *Flowers* very minute, dioecious, rarely 2-sexual, spicate, each in the axil of a bract, with or without 2 lateral bracteoles; bracts peltate or cupular, adnate to the rhachis, sometimes decurrent, with or without raised margins; bracteoles (when present) forming low ridges on each side of the flower or connate in a semilunar form. *Stamens* 2-4, rarely more; filaments short, anthers 2-celled, the cells distinct. *Ovary* 1-celled, style short, conic, beaked, or none, stigmas 2-5; ovule solitary, erect. *Fruit* a small ovoid or globose 1-seeded berry. *Seeds* usually globose, albumen floury within. Species about 600, in tropical and sub-tropical regions.

**P. brachystachyum**, Wall. *Cat.* 6656 in part; *Royle Ill.* 332; *F. B. I. v.* 87; *Kanjilal For. Fl. ed. 2.* 325; *Gamble Man.* 554; *Collett Fl. Siml.* 430; *Brandis Ind. Trees* 523.—Vern. *Pahāri pān*.

A glabrous much-branched rambling shrub. *Stems* often very long climbing on trees and rocks and rooting at the nodes; branches slender, rigid, terete, the lower often warted. *Leaves* petioled,



thinly coriaceous, 3-7 in. long, elliptic or ovate-lanceolate, obtusely caudate-acuminate, base acute; nerves prominent beneath; petioles slender,  $\frac{1}{4}$ - $\frac{1}{2}$  in.; leaves of the climbing stems much smaller, orbicular, pointed. **MALE** spikes 2-3 in. long, slender, drooping; bracts minute, peltate. **Stamens** 2, anthers reniform; cells confluent, dehiscing across the tip. **FEM.** spikes very shortly peduncled  $\frac{1}{4}$ - $\frac{1}{2}$  in. diam., globose or shortly oblong in fruit. **Berries**  $\frac{1}{10}$  in. in diam.; stigmas 3, very minute.

Dehra Dun on the banks of the Re nadi (Kanjilal), Sub-Himalayan tracts of N. Oudh in damp places (Duthie). **DISTRIB.:** Sub-tropical Himalaya from Simla to Bhutan, up to 5,000 ft.; also on the Khasia and Nilgiri Hills.

**PIPER BETLE**, *Linn.; Roxb. Fl. Ind. i, 158; F.B.I., v, 85; Duthie Field and Gard. Crops N. W. Prov. and Oudh iii, 51, tt. 91 and 91A; Watt E. D.; Comm. Prod. Ind. 891; Gamble Man, 554; Brandis Ind. Trees 523; Cooke Fl. Bomb. ii, 528.* Vern. *Pán, tambuli*, etc. (Betel pepper).—A perennial dioecious creeper extensively cultivated in the hotter and damper parts of India and in Ceylon extending to the Malay Islands. It is believed to have come originally from Java. The leaves mixed with portions of areca-nut, lime and catechu, are universally chewed by the natives of India, to which are added by well-to-do classes other ingredients such as cardamoms, nutmeg and camphor. For further particulars as to cultivation, etc., see Watt's Comm. Prod. of India 891.

**P. NIGRUM**, *L.* Vern. *Gul-mirch, kala-mirch*. (Black pepper).—This furnishes the ordinary pepper of commerce, black and white, the latter resulting in the grinding of the fruit after the removal of the outer skin. The plant is wild in Travancore and Malabar, and is cultivated in the hotter parts of India and in Ceylon and in the tropics generally.

**PEPEROMIA PELLUCIDA**, *H. B. & K.; Prain Beng. Pl. 894; Cooke Fl. Bomb. ii, 629.*—A slender much-branched glabrous and succulent annual. Has been introduced comparatively recently from S. America, and is becoming naturalized in various parts of India, and as a weed in the gardens of N. India.

### XCV.—LAURACEÆ.

Aromatic trees or shrubs, very rarely (Cassytha) leafless parasites. *Leaves* usually alternate, gland-dotted, exstipulate. *Flowers*

small, regular, 2- or 1-sexual, in axillary cymes clusters panicles or racemes; bracts deciduous, often involucre or none. *Perianth* usually inferior; tube short, sometimes enlarged in fruit; lobes of limb small, usually 6, rarely 4, in two series, usually all similar and equal, imbricate, rarely sub-valvate, herbaceous or petaloid. *Stamens* usually a multiple of the perianth-lobes, in 2-4 series on the tube; filaments flattened, inner or some or all often 2-glandular at the base; anthers erect, 2-or 4-celled, rarely 1-celled, cells dehiscing by up-curved at length deciduous valve-like lids. *Ovary* sessile at the base of the perianth-tube, 1-celled, style terminal, stigma simple or discoid or dilated; ovule solitary, pendulous from the apex of the cell, anatropous. *Fruit* a dry or fleshy berry on an often thickened peduncle, naked or rarely enclosed in or adnate to the perianth-tube. *Seed* pendulous, testa membranous, albumen none; cotyledons plano-convex, fleshy; radicle superior, minute.—Species about 1,000, chiefly in the warmer regions of Asia, Australia, America and the Pacific Islands.

Trees or shrubs :—

Anthers of the two outermost rows of stamens opening inwards, those of the third row opening outwards; flowers hermaphrodite, usually panicled :—

Anthers all 2-celled; perianth deciduous . . . 1. BEILSCHMIEDIA.

Anthers all 4-celled; perianth persistent :—

Perianth-lobes reflexed in fruit . . . 2. MACHILUS.

Perianth-lobes erect in fruit; flowers often polygamous . . . 3. PHEBE.

Anthers of each row of stamens opening inwards, 4-celled; flowers diœcious, in umbels, each umbel supported by an involucre of bracts :—

Leaves penninerved; stamens 9 or more, glands of the inner row sessile . . . 4. LITSEA.

Leaves 3-nerved above the base; stamens usually 6, glands of inner row stalked . . . 5. NEOLITSEA.

Leafless parasitic twining herbs . . . 6. CASSYTHA.

**1. BEILSCHMIEDIA**, Nees ; Fl. Brit. Ind. v, 121.

Evergreen trees or shrubs. *Leaves* alternate or opposite, penninerved. *Flowers* small, 2-sexual, usually in panicles. *Perianth-tube* short ; lobes subequal. *Stamens* 9, perfect, those of the two outer series with eglandular filaments and with the anthers introrsely 2-celled ; those of third series with 2-glandular filaments and with the anthers extrorsely 2-celled ; anthers of the innermost series replaced by ovoid or cordate staminodes. *Ovary* sessile, free from the perianth, narrowed into the style, stigma obtuse. *Fruit* an oblong ovoid or globose berry ; pedicel not or slightly thickened, the perianth quite deciduous. *Seed* with a membranous testa.—Species about 20, all tropical.

**B. Roxburghiana**, Nees in Wall. Pl. As. Rar. ii, 69 ; Brandis For. Fl. 378 ; Ind. Trees 528 ; F. B. I. v, 121 ; Watt. E. D. ; Gamble Man. 559 ; Prain Beng. Pl. 897 ; Haines For. Fl. Ch. Nagpur 151. *B. fagifolia*, Nees ; F. B. I. v, 122. *Laurus bilocularis*, Roxb. Fl. Ind. ii, 311.—Vern. *Konhaia* (Oudh).

A large or medium-sized almost evergreen tree. *Bark* ash-coloured. *Branches* many, spreading horizontally and forming a dense shady head. *Leaves* coriaceous, 6-10 in. long, elliptic or oblong-lanceolate, obtuse or bluntly acuminate, glabrous, dark-green and shining ; base cuneate ; main lateral nerves 6-12 pairs, prominent on both surfaces and finely and distinctly reticulate between ; petioles  $\frac{1}{2}$ -1 in. long. *Peduncles* axillary and from the base of the young shoots, a little shorter than the petioles, pubescent, bearing a raceme or panicle of 6-12 flowers ; bracts ovate, caducous. *Perianth* 6-partite ; segments spreading or reflexed,  $\frac{1}{4}$  in. long, linear-oblong, hairy on both sides. *Filaments* hairy ; anthers bilocular. *Berry* 1-1 $\frac{1}{2}$  in. long or more and about 1 in. in diam., narrowly oblong-obovoid, dark-purple when ripe and covered with a whitish-grey bloom which is easily rubbed off.

Forests of N. Oudh in the districts of Gonda and Bahraich, in shady ravines (R. Thompson). Flowers Mar.-April when the old leaves are falling. **DISTRIB.** : From Kumaon to Assam, Tipperah and Burma, also in Ch. Nagpur. The wood is white rather hard and even-grained, and is said to be used in Assam for making boats. I have not seen the specimens from N. Oudh.

## 2. MACHILUS, Nees ; Fl. Brit. Ind. v, 136.

Evergreen trees. *Leaves* alternate, usually crowded at the ends of the branchlets, penninerved. *Flowers* small, 2-sexual, in axillary panicles. *Perianth-tube* short or obsolete ; lobes persistent, spreading or reflexed in fruit. *Stamens* 9, perfect, filaments of the 1st and 2nd rows eglandular and with introrse 4-celled anthers ; of the 3rd row with 2 stipitate glands at the base and with extrorse 4-celled anthers ; those of the 4th row replaced by stipitate cordate staminodes. *Ovary* sessile, narrowed into the style ; stigma discoid. *Fruit* a globose or oblong berry seated on the persistent perianth.—Species about 20, in E. Asia.

Leaves up to 6 in. long, somewhat glaucous beneath,  
main lateral nerves 8-12 pairs ; perianth villous  
within ; drupe globose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam . . . . . 1. *M. Gamblei*.

Leaves up to 10 in. long, distinctly glaucous beneath,  
main lateral nerves 12-18 pairs ; perianth silky-  
tomentose outside ; drupe globose,  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. in  
diam. . . . . 2. *M. Duthiei*.

1. *M. Gamblei*, King. in *F. B. I. v*, 138 and 860 ; *Kanjilal For. Fl. ed. 2*, 327 ; *Gamble Man. 566* ; *Brandis Ind. Trees 531*.—Vern. *Kāvālā*.

A small or moderate-sized tree with dark grey bark ; shoots and young leaves beneath finely silky. *Leaves* 3-6 in. long, elliptic-lanceolate to obovate, acute or acuminate, entire, thinly coriaceous, impressed-punctate on both surfaces, glaucous and glabrous beneath when mature, main lateral nerves 8-12 pairs, slender ; petioles  $\frac{1}{4}$  in., slender. *Panicles* lax, few-flowered. *Sepals* linear-oblong, villous within. *Drupe* globose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., black when ripe.

Dehra Dun, in shady and swampy localities, fairly common (Kanjilal). Flowers in March and April. *DISTRIB.* : Outer ranges of Himalaya eastwards to Bhutan and the Duphla Hills at from 2—4,000 ft., also in the Assam Valley.

2. *M. Duthiei*, King in *F. B. I. v*, 861 ; *Kanjilal For. Fl. (ed 2)*, 327 ; *Gamble Man. 567* ; *Duthie in Ann. R. Bot. Gard. Calc. ix, part 1*, 67, t. 83 ; *Collett Fl. Siml. 431*, fig. 138 ; *Brandis Ind. Trees 531*.—Vern. *Kāvālā bhadrūo* (Garhwal), *bhojo* (Jaunsar).

A medium-sized tree with a thin dark-grey rather rough bark; young parts finely silky. *Leaves* thickly coriaceous when mature, becoming reflexed in age, 6-10 in. long, oblong or elliptic-lanceolate, acuminate, often subfalcate, dark-green and shining above, glaucous beneath; main lateral nerves 12-20 pairs; petioles about  $\frac{1}{2}$  in. long. *Panicles* about 6 in. long when in flower; peduncles and pedicels rather stout, elongating and drooping in fruit, often tinged with red. *Flowers*  $\frac{1}{2}$  in. in diam. *Sepals* linear-oblong, finely silky outside, reflexed in fruit. *Drupe* globose,  $\frac{2}{3}$ - $\frac{3}{4}$  in. in diam., changing from a dark sage-green colour to purple or almost black.

Sub-Himalayan tract of Rohilkhand in the Kota Dun at 2,000 ft. (Herb. Strachey and Winterbottom, Machilus No. 1); Kumaon Bhábar at Barmdeo (Herb. S. and W. No. 3), Kotri Dun at 1,800 ft. (Brandis). Flowers during April and May. **DISTRIB.:** W. Temp. Himalaya from Chamba and Simla to Nepal, ascending to 8,000 ft. This handsome tree is abundant in shady places on northern slopes of the outer Himalayan ranges, especially in Jaunsar and Garhwal. It is sometimes found associated with *M. odoratissima*, Nees to which the present species and some others had previously been referred, but it may easily be recognized by its larger leaves, the pubescent panicle-branches and flowers and especially by its globose drupes.

### 3. PHCEBE, Nees; Fl. Brit. Ind. v, 141.

Evergreen shrubs or trees. *Leaves* alternate, scattered or in clusters at the ends of the branchlets, penninerved. *Flowers* small, 2-sexual or polygamous, in axillary or sub-terminal panicles. *Perianth-tube* short; lobes 6, subequal, erect, accrescent and clasping the base of the fruit. *Stamens* 9, perfect; those of the 2 outer rows eglandular at the base and with extrorse 4-celled anthers; of the 3rd row 2-glandular at the base, with extrorse 2-celled anthers, those of the 4th row replaced by cordate or sagittate staminodes. *Ovary* sessile, narrowed into the style, stigma discoid. *Fruit* an ellipsoid or oblong berry, clasped at the base by the hardened perianth-segments.—Species about 26, in India and Malaya.

Quite glabrous except the young shoots and the perianth inside . . . . .

1. *P. lanceolata*.

Panicles and flowers puberulous . . . . .

2. *P. pallida*.

**1. *P. lanceolata*, Nees Syst. Laurin. 109, F. B. I. v, 141; Brandis For. Fl. 377; Ind. Trees 532; Watt E. D.; Kanjilal For. Fl. (ed. 2), 328; Gamble Man. 568; Collett Fl. Siml. 432; Prain Beng. Pl. 900. *Laurus lanceolaria*, Roxb. Fl. Ind. ii, 308.—Vern. *Haulia* (Hind.), *tumri* (Dehra Dun).**

A small evergreen tree with yellowish-white bark, quite glabrous except the very young parts and the perianth inside. *Leaves* thinly coriaceous, usually crowded towards the ends of the branches, 6-9 in. long, elliptic-lanceolate, caudate-acuminate, narrowed below into a short petiole; main lateral nerves 6-10 pairs. *Flowers* pale-yellow, 2-sexual, or sometimes polygamous,  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, arranged in lax axillary panicles 2-4 in. long; peduncles slender, about 2 in. long when in flower, elongating in fruit. *Perianth-segments* broad, obtuse, villous inside, erect in fruit. *Fruit* narrowly ellipsoid, clasped at the base by the hardened perianth, black when ripe.

Sub-Himalayan tracts from Dehra Dun (Gamble) to the forests of N. Oudh (Brandis). *Flowers* Feb.-June. *DISTRIB.*: Outer Himalayan ranges from Simla to Bhutan up to 6,000 ft.; also on the Khasia Hills and in Burma. The wood is hard and close-grained and is said to be used for planks.

**2. *P. pallida*, Nees Syst. Laurin. 112; Brandis For. Fl. 377; Ind. Trees 532; F. B. I. v. 142; Gamble Man. 567.**

A small tree with finely puberulous shoots. *Leaves* coriaceous, 6-9 in. long, elliptic-lanceolate, or oblanceolate, acuminate, pubescent beneath when young; main lateral nerves 8-10 pairs, very oblique, deeply impressed above, prominent beneath. *Panicles* long-peduncled. *Flowers* puberulous.

Moist ravines in the forests of E. Oudh (Brandis). *Flowers* in June. *DISTRIB.*: Kumaon Himalaya up to 5,000 ft., and eastwards to Nepal and Sikkim. Perhaps too closely allied to *P. lanceolata* to be regarded as more than a variety.

#### 4. *LITSEA*, Lamk.; Fl. Brit. Ind. v, 155.

Trees or shrubs, usually evergreen. *Leaves* alternate, rarely opposite or subopposite, penninerved, rarely 3-nerved from the base, buds naked or scaly. *Flowers* small, dioecious, usually umbellate; umbels 4-6 (rarely more)-flowered, sessile or shortly peduncled; peduncles clustered, rarely solitary, axillary or in the

leaf-scars, sometimes racemose or fascicled on common peduncles; bracts involucrate, 4-6, rarely more in one involucre, coriaceous or membranous. *Perianth-tube* ovoid campanulate or very short; lobes of limb 6 or 4, equal or unequal, sometimes small or obsolete. MALE flowers: *Stamens* 9 or 12 in trimerous flowers, 6 in dimerous flowers, occasionally fewer than 6, rarely more than 12; filaments of 1st and 2nd rows usually eglandular, those of the 3rd (and 4th if present) 2-glandular; anthers all introrse, 4-celled. *Ovary* minute or obsolete, very rarely perfect. FEM. fls. *Staminodes* 9 or 12, or in the dimerous flowers 6 (rarely more than 12). *Ovary* enclosed in the perianth-tube or free; style short or long, stigma usually irregularly lobed. *Fruit* a drupe or berry seated on the un-enlarged perianth, or partly clasped at the base by the often much enlarged discoid or cupular perianth-tube. *Seed* with a thin testa. —Species about 140, in Trop. Asia, Australia and the Pacific Islands, rare in Africa and America.

Perianth-lobes incomplete or none; leaves oblong or ovate-acute, lower surface sparingly pubescent or closely tomentose; fruit globose, seated on the slightly enlarged perianth-tube 2. *L. chinensis*.

Perianth-lobes complete, 6- or 5-partite:—

Leaves elliptic or elliptic-oblong; upper surface glabrous; lower surface grey- or tawny-pubescent; main lateral nerves 5-10 pairs; fruit ovoid, on a very small perianth-tube . 2. *L. polyantha*.

Leaves usually narrowly lanceolate, acute or acuminate, grey-hoary, rarely glabrous beneath; main lateral nerves 8-15 pairs; fruit on the enlarged per.-tube, ellipsoid 2.5 l. 3. *L. salicifolia*,  
var. *laurifolia*

1. *L. chinensis*, Lamk. *Encycl. Method.* iii, 574; Cooke *Fl. Bomb.* ii, 539; Gamble in *Journ. As. Soc. Beng.* LXXV, part. 1, 131. *L. sebifera*, Pers. *Syn.* ii, 4; *F. B. I.* v, 157; Watt *E. D.*; *Kanjilal For. Fl.* (ed. 2), 329; *Gamble Man.* 570; *Prain Beng. Pl.* 902; *Brandis Ind. Trees*, 536. *Tetranthera laurifolia*, Blume; (not of Roxb.); *Brandis For. Fl.* 379. *T. apetala*, Roxb. *Fl. Ind.* iii, 819; *Royle Ill.* 325. *T. Roxburghii*, Nees; *Royle l. c.*—Vern. *Maida*, *gwa* (Hind.), *medh* (Oudh), *chandna* (Dehra Dun).



A small or medium-sized evergreen tree, very variable in habit foliage and inflorescence. *Bark* dark-grey, cork-like, with an inner viscid layer. Young parts inflorescence and underside of leaves more or less pubescent or tomentose. *Leaves* thinly coriaceous, 5-9 in. long, ovate oblong or elliptic-lanceolate, acute obtuse or rounded at the apex, glabrous or pubescent on the upper surface, grey-pubescent beneath and usually glabrescent when mature; main lateral nerves 8-12 pairs, and with fine reticulations between; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long. *Flowers* globose, white or yellowish,  $\frac{1}{4}$  in. in diam. before expansion, arranged in axillary peduncled corymbose or racemose umbels; bracts 4, tomentose. *Perianth* very irregular, the segments often wanting, tube long and silky. *Stamens* 9 to 20 or more; filaments villous. *Fruit* globose,  $\frac{1}{4}$  in. in diam., supported by the slightly enlarged perianth-tube.

Fairly common in the forests of Dehra Dun and Saharanpur, especially in shady ravines; also in the Sub-Himalayan districts of Rohilkhand, N. Oudh and Gorakhpur. It flowers in the rains and the fruit ripens during the cold season. *DISTRIB.*: Throughout the hotter parts of India and in Ceylon, extending to the Malay Islands, China and Australia. The wood of this tree, as described by Gamble, is greyish-brown or olive-grey, moderately hard and durable, and it is not attacked by insects. The granular and viscid inner bark (*meda-lakri*) is said to be good for sprains and bruises.

**2. *L. polyantha*, Juss.** in *Ann. Mus. Par.* vi, 211; *F. B. I. v.* 162; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 330; *Gamble Man.* 571; *Collett Fl. Siml.* 433; *Prair Beng. Pl.* 903; *Brandis Ind. Trees* 536. *Tetranthera monopetala*, *Roxb. Fl. Ind.* iii, 821; *Brand. For. Fl.* 380; t. 45.—Vern. *Maida*, *latmarra* (Hind.), *karkawa*, *karka* (Dehra Dun).

A moderate-sized evergreen tree, the young parts inflorescence and underside of leaves rusty-tomentose. *Bark* dark-grey, finally exfoliating in corky-scales. *Leaves* alternate, very variable, 4-8 in. long or more, elliptic-oblong ovate or obovate, tip usually rounded or retuse, glabrous above, rusty-tomentose and strongly reticulate-veined beneath; main lateral nerves 5-10 pairs, base rounded or cordate, petiole  $\frac{1}{2}$ -1 in. long. *Umbels* 5-6-flowered, densely tomentose, pedicels stout, bracts 4-5. *Perianth* white, 6- or 5-partite. *Stamens* 9-13, filaments hairy. *Fruit* ovoid, about  $\frac{1}{4}$  in. long, seated on the small unchanged perianth.

Common in the forests of Dehra Dun and Saharanpur and eastwards to the Sub-Himalayan tracts of Rohilkhand and N. Oudh, often found in shady ravines and on the banks of streams. Flowers March-May.

the new foliage appearing at about the same time, and the fruit ripens about 3 or 4 months later. **DISTRIB.:** Salt Range and Punjab Himalaya and eastwards to Nepal up to 3,000 ft., also in Assam, Bengal, Central India, Orissa, Burma and Malay Peninsula, extending to Java and China. The wood of this tree is similar in appearance to that of *L. chinensis*, but is softer and less durable. Its medicinal properties are the same. The leaves when crushed have a strong scent of cinnamon, they are used in Assam for feeding the Muga silk-worm.

**L. salicifolia**, Hook. f. **VAR. laurifolia**, F. B. I. v, 167; Prain Beng. Pl. 903. *Tetranthera salicifolia*, Roxb. T. laurifolia, Roxb. Fl. Ind. iii, 823; T. lanceifolia, Roxb. l. c. 822.

An evergreen bush or small tree; branchlets puberulous. *Leaves* sub-distichous, 3-5 in. long, variable in shape from elliptic to linear-lanceolate or linear-oblong, obtuse or acute or acuminate, brownish and glabrous above, grey-hoary rarely glabrous beneath; lateral nerves 8-15 pairs, prominent beneath; petioles  $\frac{1}{2}$ -1 in. *Umbels* clustered; pedicels short, slender. *Stamens* 6-9; filaments villous. *Fruit*  $\frac{1}{2}$  in. long, narrowly ellipsoid, seated on the funnel-shaped or clavate perianth-tube.

Forests in the Sub-Himalayan tracts of N. Oudh (Brandis). **DISTRIB.:** Outer Himalayan ranges from Nepal to Sikkim, up to 6,000 ft.; also in Assam, the Garo, Khasia and Naga Hills, Bengal Plain, Sundribuns and Chittagong, extending to Upper and Lower Burma.

**5. NEOLITSEA**, Merr.; included under *Litsea* in Fl. Brit. Ind. v, 178.

Evergreen trees. *Leaves* alternate opposite or in whorls, 3, nerved, more or less lanceolate; buds perulate. *Flowers* diœcious, in 3-7-fld. umbellules arranged in clusters or short racemes in the axils of the upper leaves or on the branchlets between the nodes, the clusters with small bracts at their bases; involucre bracts 4, deciduous; pedicels elongating. *Perianth* 4-partite. *Stamens* of male flowers 6; those of the 2 outer rows eglandular; the inner biglandular; anther-cells all introrse or the lower lateral. *Staminodes* of fem. flowers 6, arranged as the stamens, usually linear or linear-clavate. *Ovary* ovoid, style thick, stigma usually peltate, in the male flowers none or rudimentary. *Fruit* a globose or elliptic-oblong berry, seated on the slightly enlarged disciform

perianth-tube; pedicels somewhat elongate; pericarp smooth. Cotyledons hemispheric.—Species about 30, in India or Malaya, one or more extending to the Philippines and Australia.

*N. lanuginosa*, Duthie. *Tetradenia lanuginosa*, Nees in Wall. *Pl. As. Rar.* ii, 64. *Litsea lanuginosa*, Nees *Syst. Laur.* 634; *Brandis For. Fl.* 382; *Ind. Trees* 540; *F. B. I.* v, 178; *Kanjilal For. Fl.* (ed. 2), 331; *Gamble Man.* 573; *Collett Fl. Siml.* 433. *Tetranthera Cuipala*, Don. *Prod.* 65.

A tall or moderate-sized tree, with brownish bark. Leaf-buds conspicuous, enclosed within softly pubescent scales, the terminal ones often up to 1 in. in length. Leaves alternate or more or less crowded in whorls towards the ends of the branchlets, thickly coriaceous, 6-12 in. long, elliptic-lanceolate or -oblanceolate, acute or acuminate, softly tomentose beneath when young, soon becoming glabrous and glaucous, prominently 3-nerved above the base; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in. Flowers and bracts villous, the latter soon falling; pedicels of fem. flowers longer than those of the males. Perianth-segments fringed, silky outside. Stamens longer than the perianth; glands of the 2 inner filaments long-stalked. Berry about  $\frac{1}{2}$  in. long, its pedicel thickened towards the apex.

Dehra Dun, in the Mothronwala swamp (Kanjilal). Flowers Feb.-June. DISTRIB.: Outer Himalayan ranges from Kashmir, sparingly at about 3,000 ft., and eastwards to Sikkim up to about 6,000 ft., also on the Khasia Hills.

#### 6. CASSYTHA, Linn.; Fl. Brit. Ind. v, 187.

Filiform twining parasites, adhering to their hosts by suckers. Leaves of minute scales or none. Flowers minute, bisexual, sometimes dimorphic, in spikes heads or racemes, bracteoles 3. Perianth-tube short and globose, or in the same species often as long as the limb and turbinate; segments 6, the 3 outer smaller. Stamens 9 or 6, perfect, those of the 1st row with eglandular filaments and introrsely 2-celled anthers; of the 2nd row similar or reduced to staminodes; of the 3rd row with 2-glandular filaments and extrorsely 2-celled anthers; those of the 4th row replaced by sessile or stipitate staminodes. Ovary globose, free in flower, in fruit closely covered by the enlarged perianth; stigma sessile, small or capitate. Fruit a small drupe, enclosed in the succulent

perianth-tube and crowned by the perianth-lobes. *Seed* with thin testa, cotyledons at length confluent.—Species 15, one of which is widely spread throughout the tropics; 1 or 2 are found in S. Africa and in Borneo; the rest are Australian.

*C. filiformis*, Linn. *Sp. Pl.* 35; Roxb. *Fl. Ind.* ii, 314, *F. B. I.* v, 188; Watt *E. D.*; Prain *Beng. Pl.* 904; Cooke *Fl. Bomb.* i, 541.—Vern. *Amarbeli*.

A twining leafless parasite with the habit of *Cuscuta*, quite glabrous or the young parts puberulous. *Stems* long, slender, cord-like, often intricately matted, branched, dark-green. *Flowers* small, sessile, in lax dense divaricate spikes  $\frac{1}{2}$ -2 in. long; bracteoles small, rounded, ciliate. *Perianth* twice as long as the bracteoles, tube short; segments 6, in two rows, the three outer short; the inner longer, oblong, acute, concave, valvate. *Fruit* about  $\frac{1}{2}$  in. in diam., globose, smooth, white, enclosed in the fleshy perianth-tube and crowned by the erect segments.

Bundelkhand (Edgeworth), and probably in many other localities within the area. *DISTRIB.*: Throughout the greater part of India, especially near the sea-coast, also, in Ceylon, the S. Andaman Islands, extending to the Malay Pen. and Islands, Arabia, Mascarene Islands, Trop. Africa, Australia, Polynesia and America.

The following plants belonging to genera not indigenous within the area of this flora deserve to be briefly mentioned:—

*CINNAMOMUM ZEYLANICUM*, Nees in Wall. *Pl. As. Rar.* ii, 74; *F. B. I.* v, 131; DC. *l'Orig. Pl. Cult.* 116; Brandis *For. Fl.* 375; *Ind. Trees* 533; Watt *Comm. Prod. Ind.*; Prain *Beng. Pl.* 899; Cooke *Fl. Bomb.* ii, 535. *Laurus Cinnamomum*, Roxb. *Fl. Ind.* ii, 295.—The bark of this tree yields the true cinnamon of commerce. It is found wild in W. & S India, Ceylon and Burma, and is cultivated in the Malay Islands and elsewhere in the tropics.

*C. TAMALA*, T. Nees and Eberm.; *F. B. I.* v, 128; *C. albiflorum*, Nees; Royle *Ill.* 325. *Laurus Cassia*, Roxb. *Fl. Ind.* ii, 297. Vern. *Dalchini*, *tezpat*.—A moderate-sized evergreen tree, closely allied to *C. zeylanicum*. It is found abundantly on the outer Himalayan ranges up to 7,000 ft., and the root-bark and leaves are much valued for medicinal purposes.

*C. CAMPHORA*, T. Nees and Eberm. (The Camphor tree of China and Japan).—An evergreen tree much cultivated in Indian gardens. It

thrives fairly well in Dehra Dun, and in the Government Garden at Saharanpur.

*PERSEA GRATISSIMA*, Gaertn. *j.* (The Avocada or Alligator Pear). A native of Trop. S. America. It is cultivated in Indian gardens. The pear-shaped fruit, about 4-6 in. long, contains a single seed which is embedded in a soft pulp.

*LAURUS NOBILIS*, Linn. (Sweet Bay or Laurel).—A small slow-growing evergreen tree of the Mediterranean region, and well-known on account of its aromatic leaves.

### XCVI.—ELÆAGNACEÆ.

Shrubs or trees, copiously covered with silvery or brown scales. *Leaves* alternate or opposite, entire, exstipulate, usually coriaceous. *Flowers* small, regular, 2-sexual or dioecious, arranged in axillary fascicles spikes or racemes, rarely from leafless axils; bracts small, deciduous or none. *Perianth* in 2-sexual or female flowers tubular, narrowed above the ovary and persistent below, deciduous above; limb 2-4-lobed, rarely truncate; perianth in male flowers reduced to a 2-4-lobed limb. *Stamens* of 2-sexual flowers adnate to the throat of the perianth, those of the male flowers adnate to the base of the perianth, 4 alternate with or 8 both opposite to or alternate with the perianth-lobes; filaments free, usually short; anther oblong, 2-celled; cells parallel, contiguous, staminodes in fem. flowers none. *Ovary* free, 1-celled; style terminal, linear or dilated above, stigma lateral; ovule solitary, erect, basal, anatropous. *Fruit* a nut, enclosed in the perianth-tube. *Seed* erect, testa hard, albumen scanty or none, embryo straight; cotyledons thick, fleshy; radicle inferior, very short.—Species 17, in north temperate and tropical regions.

*ELÆAGNUS*, Linn.; Fl. Brit. Ind. v, 201.

*Flowers* 2-sexual, solitary or 2-3-nate, or sometimes on short leafless or leafy branchlets, bracts none. *Perianth* with an oblong or globose persistent base, narrowed above the ovary into a campanulate or funnel-shaped deciduous limb, yellow or white within, valvately 4-lobed and usually with a prominent ring inside above

the constriction. *Stamens* 4, on the mouth of the perianth. *Style* linear, included. *Fruit* enclosed in the persistent accrescent usually berry-like perianth-base, pericarp thin. *Seed* with a hard shining testa.—Species 12, in S. Europe, Temp. and Trop. Asia, Australia and N. America.

*E. latifolia*, Linn. *Sp. Pl.* 121; Brandis *For. Fl.* 390, t. 46; *Ind. Trees* 547; *F. B. I. v.* 202; Watt *E. D.*; *Kanjilal For. Fl.* (ed. 2), 334; *Gamble Man.* 581; *Prair Beng. Pl.* 908; *Cooke Fl. Bomb. ii.* 543; *E. conferta*, Roxb. *Fl. Ind. i.* 440; *Royle Ill.* 323. *E. arborea*, Roxb. *l. c.* 441; *Don. Prod.* 67.—Vern. *Ghiwai*.

A much-branched evergreen usually scandent shrub; branches often spinescent; young shoots densely clothed with shining rust-coloured scales. *Leaves* variable, thin or more or less coriaceous, 3-5 in. long, broadly elliptic to lanceolate, obtuse, acute or acuminate; upper surface pale-green, scurfy, the lower coated with silvery white or rust-coloured glistening scales; lateral nerves 6-8 pairs; base acute or rounded; petioles scaly,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long. *Flowers* usually many in a cluster, straw-coloured, scented; pedicels elongating in fruit. *Perianth*  $\frac{1}{2}$  in. long, clothed with silvery scales, as are the pedicels; lobes  $\frac{1}{2}$  in. long, ovate, acute, spreading. *Style* hairy. *Fruit* crowned by the upper free portion of the perianth, about 1 in. long, ellipsoid or pear-shaped with 8 strong blunt ribs, pinkish when ripe and rough with small white spots; endocarp white, woolly within. *Seed*  $\frac{3}{4}$  in. long.

Dehra Dun, usually in swampy ground (Kanjilal); also in the Sub-Himalayan tracts eastwards. *Flowers* Nov.-Feb., and the fruit ripens during May and June. *DISTRIB.*: Subtrop. Himalaya from the Sutlej to the Mishmi Hills, ascending to about 8,000ft., and from Bengal and the Konkan southwards to Ceylon; extending to Burma, the Malay Peninsula and China. The sub-acid astringent fruit is much eaten by the village people and is sometimes used as a preserve. The wood affords a good fuel.

## XCVII.—LORANTHACEÆ.

Evergreen parasitic shrubs. *Leaves* opposite, usually entire, coriaceous, exstipulate, sometimes absent. *Flowers* 2-or 1-sexual, in racemes spikes heads or fascicles; bracts usually scale-like, bracteoles usually 2. *Perianth* simple or double. *Sepals*, or simple

perianth when sepaloid, adnate to the ovary, in fem. flowers solid or obsolete; limb annular or cupular, entire or shortly toothed. *Petals*, or simple perianth-segments when petaloid, 3-6, rarely 2, valvate, free or more or less connate in a tube or in a sheath split on the upper side. *Stamens* as many as and opposite the corolla-lobes and usually adnate to them; filaments usually filiform; anthers usually 2-celled, bursting longitudinally or by pores. *Disk* epigynous or in fem. flowers within the stamens, fleshy and rather prominent or none. *Staminodes* in fem. flowers and rudimentary ovary in male flowers rarely present. *Ovary* inferior, at first apparently solid, at length 1-celled; style short or long, stigma simple; ovule solitary, erect, adnate throughout to the walls of the ovary. *Fruit* a 1-seeded berry or drupe. *Seed* adnate to the pericarp; albumen fleshy, often toothed at the apex, or none; embryo straight, usually fleshy, radicle superior.—Species about 500, mostly tropical.

- Flowers bisexual; style long . . . . 1. LORANTHUS.  
 Flowers unisexual; style short or none . . . 2. VISCUM.

### 1. LORANTHUS, Linn.; Fl. Brit. Ind. v, 203.

Semiparasitic shrubs, usually on trees. *Leaves* opposite, rarely alternate, usually thick and fleshy or coriaceous, nerves obscure. *Flowers* 2-sexual, usually coloured, in spikes racemes or cymes, axillary or on the old nodes; bracts concave or oblique, cupular; bracteoles 2, free or connate with the bract or none. *Perianth* double. *Calyx-tube* adnate to the ovary; limb short, truncate or 4-6-toothed or obsolete. *Petals* 4-6, valvate, free or more or less connate in a tube with spreading tips, or in a sheath split behind; tube naked or with conniving scales at the base. *Stamens* 4-6, adnate to the petals; anthers adnate or versatile, with parallel cells. *Disk* none. *Style* columnar, filiform, rarely twisted. *Fruit* a berry or drupe, 1-seeded. *Embryo* usually fleshy, cotyledons 2 or 4.—Species about 350, mostly tropical.

Corolla of 4 free petals; flowers small, shortly pedicelled, rusty-pubescent; anthers continuous with the filaments, distinctly 2-celled 1. *L. ligustrinus*.



Corolla gamopetalous, 4-5 lobed or-partite, the tube split above; anther-cells indistinct; flowers nearly always mealy or scurfy :—

Corolla 4-fid.; calyx hardly produced above the ovary; leaves mealy or scurfy on the lower and usually also on the upper surface :—

Fruit mealy, clavate; young shoots and leaves covered with flocculent white fugacious mealy tomentum; flowers long-pedicelled in solitary or fascicled racemes, scurfy white-tomentose . . . . . 2. *L. pulverulentus*.

Fruit tomentose, pyriform; young shoots and leaves covered with short soft rusty or white scurfy tomentum :—

Leaves less than 3 in. wide, sessile or shortly petioled; base cuneate or rounded, rarely subcordate, appressed tomentose or glabrate beneath . . . . . 3. *L. Scurrula*.

Leaves large, exceeding 3 in. in width, orbicular or broadly ovate; base cordate or rounded, densely tomentose beneath; petioles long . . . . . 4. *L. cordifolius*.

Corolla 5-fid.; calyx distinctly produced above the ovary; leaves and flowers glabrous; fruit oblong . . . . . 5. *L. longiflorus*.

***L. ligustrinus***, Wall. in Roxb. *Fl. Ind.* (ed. Carey and Wall.) ii, 219; Don. *Prod.* 143; Brandis *For. Fl.* 395; *Ind. Trees* 549; *F. B. I.* v, 207; Kanjilal *For. Fl.* (ed. 2), 336; Gamble *Man.* 582; *Prain Beng. Pl.* 811.

A parasitic shrub, or sometimes a small terrestrial tree parasitic on roots; young shoots and inflorescence rusty-pubescent; bark pale-coloured, closely lenticellate. *Leaves* glabrous, opposite or the upper alternate,  $1\frac{1}{2}$ - $2\frac{1}{2}$  in. long, lanceolate, obtuse acute or acuminate, pinnerved, brown or black when dry, thinly coriaceous; nerves obscure; base acute; petioles  $\frac{3}{4}$ - $1$  in. *Racemes* axillary, single or in pairs,  $\frac{1}{2}$ -in. long. *Flowers* 4-merous,  $\frac{1}{2}$ -in. long; pedicels very short; buds subterete, swollen at the base; bracts rather large, orbicular. *Galyx*-limb entire. *Corolla* pink outside, deep-red within. *Petals* 4, free,

linear, reflexed from the middle. Ovary urceolate, rusty-pubescent. Fruit  $\frac{1}{4}$  in. long, ovoid, truncate, brown when ripe.

Dehra Dun, occasionally met with in the forests (Kanjilal); Siwalik range in the Timli Pass (Griffith). Flowers May-July. DISTRIB.: Outer Himalayan ranges from the Jumna to Sikkim, ascending to 4,000 ft.; also in Assam, the Khasia Hills and in Chittagong.

2. *L. pulverulentus*, Wall. in Roxb. Fl. Ind. (ed. Carey and Wall.) ii, 221; Brandis For. Fl. 396; Ind. Trees 549; F. B. I. v, 211; Kanjilal For. Fl. (ed. 2), 337; Gamble Man. 582; Prain Beng. Pl. 911.

A robust branch-parasite; branchlets and young leaves clothed with white flocculent fugacious mealy tomentum. Leaves opposite, long-petioled, 2-8 in. long, broadly ovate, acute or obtuse, glabrous, dark-brown when dry; nerves distinct, arching. Racemes solitary or in fascicles,  $\frac{1}{2}$ -2 $\frac{1}{2}$  in. long; bracts minute. Flowers about 1 in. long, on long pedicels, scurfily white-tomentose. Calyx-limb none. Corolla slender, curved, green when fresh, cream-coloured when dry; tube terete, split above; lobes 4, connate. Fruit clavate, mealy.

Forests of Dehra Dun and Saharanpur, and in the Sub-Himalayan tracts eastwards; often found on *dhák*, *shisham* and on other trees. Flowers Dec.-June. DISTRIB.: Subtropical Himalaya, from Chamba and Garhwal to Bhutan, up to 3,000 ft., also in N. Bengal and in the C. Provinces.

3. *L. Scurrula*, Linn. Sp. Pl. ed. 2, 472; Roxb. Fl. Ind. i, 550; F. B. I. v, 208; Kanjilal For. Fl. (ed. 2), 336; Gamble Man. 582; Prain Beng. Pl. 911; Cooke Fl. Bomb. ii, 546; Brandis Ind. Trees 549.

A large bushy branch-parasite, very variable. Branches terete; bark often copiously lenticellate; young parts rusty-tomentose. Leaves opposite, sessile or stalked, coriaceous,  $1\frac{1}{2}$ -3 in. long, less than 3 in. wide, elliptic or ovate-oblong, obtuse, glabrous or nearly so above, more or less rusty-tomentose beneath, or subglabrous beneath (when mature); base sub-acute or rounded, rarely sub-cordate. Flowers  $\frac{1}{2}$  1 in. long, arranged in axillary short-peduncled rusty or grey-tomentose sub-racemose fascicles; pedicels slender; buds clavate; bracts minute, obliquely ovate, concave, tomentose. Calyx subcuneate; limb truncate, very short. Corolla greenish-yellow, tomentose; lobes 4, narrow, acute. Fruit  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, pyriform, tomentose. Albumen pink, obtusely quadrangular at the radicle end, the other end terminating in a hard elongated point, surrounded by a green sticky layer;

embryo green, fusiform; radicle not distinguishable from the tigellus (Talbot in *Trees Bomb.* ed. 2, p. 239).

Siwalik range (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers during the cold season. **DISTRIB.:** Throughout the greater portion of India (except the Punjab and Sind), extending to Ceylon and the Malay Peninsula and Islands.

4. *L. cordifolius*, Wall. in *Roxb. Fl. Ind.* (ed. Carey and Wall.) ii, 222; *Don Prod.* 143; *Brandis For. Fl.* 396; *Ind. Trees* 549; *F. B. I. v.*, 209; *Kanjilal For. Fl.* (ed. 2), 337; *Collett Fl. Siml.* 438; *Prain Beng. Pl.* 911.

A stout branch-parasite; young shoots and leaves covered with soft rusty or white scurfy tomentum. *Leaves* opposite, orbicular or broadly ovate, exceeding 3 in. in width, obtuse or rounded at the apex; base rounded or cordate; lower surface densely white-tomentose; petioles about  $\frac{1}{2}$  in. long or more. *Flowers*  $\frac{3}{4}$ -1 in. long, arranged in short lateral 2-chotomous corymbs, densely rufous or white-tomentose; buds acute. *Corolla* slender, curved, terete; tube split behind; lobes 4, short, acute. *Fruit* clavate,  $\frac{1}{2}$  in. long, tomentose.

Dehra Dun and Siwalik range (Kanjilal), also in N. Oudh in the Bahraich forests (Duthie). Flowers during the cold season. **DISTRIB.:** Outer Himalayan ranges from Kashmir to Nepal, up to 5,000 ft.; abundant on *Woodfordia* in Behar and Chota Nagpur, extending southwards to the Nilgiri Hills and Ceylon. It is very closely allied to *L. Scurrula* from which it may be distinguished by its greater size, its much broader and usually cordate leaves and by the copious white tomentum.

5. *longiflorus*, Desr. in *Lamb. Encycl. Meth.* iii, 598; *Brandis For. Fl.* 397; *Ind. Trees* 549; *F. B. I. v.*, 214; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 337; *Gamble Man.* 583; *Collett Fl. Siml.* 439; *Prain Beng. Pl.* 911; *Cooke Fl. Bomb.* ii, 548; *L. bicolor*, *Roxb. Fl. Ind.* i, 548.—Vern. *Banda, patha*.

A large bushy usually glabrous branch-parasite; bark grey, smooth. *Leaves* usually opposite, glabrous and thickly coriaceous, 3-7 in. long, very variable in shape and venation, ovate elliptic or linear-oblong, obtuse; midrib prominent, usually red, secondary nerves obscure; petioles stout,  $\frac{3}{4}$ -1 in. long. *Flowers* in stout spreading axillary or supra-axillary unilateral racemes, often two from an axil; pedicels short; bracts broadly ovate, concave, subacute. *Calyx*

distinctly produced above the ovary,  $\frac{1}{8}$  in. long, hoary-tomentose, tube cylindrical; limb cupular truncate or shortly 5-toothed. *Corolla* usually glabrous; tube curved, widened upwards, split on the back, red or orange, rarely pink or white; lobes 5, linear, reflexed,  $\frac{3}{8}$  in. long, green or yellowish. *Fruit*  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, ovoid-oblong, crowned by the cup-shaped calyx, black when ripe. *Albumen* white, copious, with five linear teeth at the top surrounding the green embryo, which resembles a small nail  $\frac{1}{4}$  in. long with a flattened head representing the radicle. (Talbot in *Trees Bomb.*, ed. 2, p. 290).

Abundant in all parts of the area and especially in the forest tracts, where it is very destructive to a great many kinds of trees, especially the *mango*, the *mahua*, and *nim*. It flowers chiefly during the cold season. **DISTRIB.:** More or less throughout India, ascending to 3,000 ft. in the W. Himalaya; also in Ceylon, Burma and Australia.

In the Government garden at Saharanpur there used to exist a very interesting specimen in which this species of *Loranthus* played a prominent part as illustrating the occurrence of parasitism on the branches of an epiphyte (*Ficus religiosa*). This latter, having commenced life as an epiphyte on the stem of a Wild Date Palm (*Phoenix sylvestris*), rapidly developed its aerial roots downwards so as ultimately to form a continuous casing round the entire trunk of the palm from a height of 20 feet or more. The presence of some kind of lichen growth on the woody branches of the *Loranthus* would have added a further link to the interesting symbiotic history of this remarkable composite specimen of vegetation.

## 2. VISCUM, Linn; Fl. Brit. Ind. v, 223.

Shrubs, semi-parasitic on trees. *Leaves* flat and thick, or reduced to small scales or teeth. *Flowers* small, diœcious or monœcious, fascicled or rarely solitary in the axils or on nodes, rarely terminal; bracts usually small; bracteoles free or connate, rarely obsolete. *Perianth-tube* of male-flowers short, solid, of the females adnate to ovary; limb 3-4 lobed, lobes usually deciduous. *Stamens* 3-4; anthers broad, sessile, adnate to the perianth-lobes; cells confluent, opening by many pores. *Ovary* inferior; stigma sessile or subsessile, large, pulvinate. *Fruit* a succulent berry, the mesocarp soft and viscid. *Embryo* in fleshy albumen, solitary or 2 in each seed.—Species about 30, in temp. and trop. regions.

- |  |                            |
|--|----------------------------|
| Branches leafy, terete . . . . .       | 1. <i>V. monoicum</i> .    |
| Branches leafless, flattened . . . . . | 2. <i>V. articulatum</i> . |

1. *V. monoicum*, Roxb. Hort. Beng. 105; Fl. Ind. iii, 763; Brandis For. Fl. 393; Ind. Trees 552; F. B. I. v, 224; Watt E. D.; Gamble Man. 584; Prain Beng. Pl. 912; Cooke Fl. Bomb. ii, 552.

A large parasitic shrub. Branches slender, smooth, terete, slightly swollen at the nodes. Leaves shortly petioled, rather thin and usually drying black, 1-5 in. long, variable in width, obliquely ovate or lanceolate, often falcately curved, acute or acuminate; basal nerves 3-5, prominent. Flowers minute, monœcious, greenish, arranged in axillary sessile or shortly stalked usually 3-flowered fascicles; central flower of each fascicle usually male; bracts truncate, apiculate. Perianth-lobes 3 or 4, triangular-oblong. Berry  $\frac{1}{2}$ - $\frac{1}{4}$  in. long, oblong, narrowed at both ends.

Bundelkhand (Edgeworth); Forests of N. Oudh (Vicary, R. Thompson, Duthie), Gorakhpur (Vicary). Flowers in May. DISTRIB.: Behar, Chota Nagpur, W. and C. Bengal, Sundribuns; also in the Nepal and Sikkim Terai, Khasia Hills, Bombay Pres., S. India, Ceylon and Burma. The Bundelkhand specimens collected by Edgeworth near Banda on *Zizyphus xylopyrus* and *Bassia latifolia* indicate a more robust habit of growth. The leaves are much broader and excessively coriaceous, and the light brown colour to which they have dried gives them a different aspect as compared with typical specimens from other localities in N. India. Trimen says that in Ceylon the plant dries to a pale yellowish-brown colour. Sir Joseph Hooker was of opinion that the Banda plant might prove to be a different species. The only available material now at Kew is, however, insufficient to settle this point.

2. *V. articulatum*, Burm. f. Fl. Ind. 311; F. B. I. v, 226; Watt E. D.; Kanjilal For. Fl. (ed. 2), 339; Gamble Man. 584; Collett Fl. Siml. 440; Prain Beng. Pl. 913; Brandis Ind. Trees 552; Cooke Fl. Bomb. ii, 553; *V. attenuatum*, DC.; Brandis For. Fl. 394. *V. dichotomum*, Don. Prod. 142. *V. opuntioides* Heyne; Roxb. Fl. Ind. iii, 763.—Vern. *Budu*, *pand*.

A much-branched parasitic leafless shrub forming pendulous tufts 6 in. to 3 ft. long. Branches jointed, the internodes 1-2 in. long, flattened somewhat narrowed at each end, readily disarticulating, pale-green when fresh, yellowish-brown when dry and longitudinally furrowed. Flowers monœcious, very minute, 3-4-merous, very shortly stalked, 1-6 together in fascicles at the nodes, each with a cupular bract at the base. Perianth of male flowers reflexed. Female flowers 2-bracteolate, the perianth-lobes erect, triangular. Berry  $\frac{1}{4}$  in. in diam., subglobose, greenish-yellow, smooth.

Bundelkhand (Edgeworth), Siwalik range near Dehra Dun (Kanjilal).  
 DISTRIB.: Sub-trop. Himalaya from the Punjab eastwards to Sikkim and up to 3,000 ft.; also in Central, W. and S. India and Ceylon; extending to Burma and the Malay Peninsula and Islands to Australia. *V. dichotomum* appears to be the more common form within the area of this flora, and may be distinguished by its more robust habit and by its thicker and broader internodes.

V. ALBUM. Linn. is the true "Mistletoe," easily distinguished from the other species of this genus by its large flat coriaceous leaves, the diceious flowers, and by its white almost transparent berries. In India it is confined to the N. W. Himalaya at elevations between 4,000 and 9,000 ft. It is found on various trees, but very rarely on oaks. It extends westwards through Afghanistan to the Atlantic and to N. Asia and eastwards to Japan.

### XCVIII.—SANTALACEÆ.

Trees shrubs or herbs, often semi-parasitic on roots. *Leaves* alternate or opposite, quite entire, sometimes scale-like or none, nerves inconspicuous, stipules none. *Flowers* 2-or 1-sexual, regular, usually small, in simple or compound cymes, bracts usually small or sometimes leafy; bracteoles 2, free or connate, sub-opposite, sometimes one or both obsolete. *Perianth* superior or inferior, simple, green or coloured; limb 3-8-toothed-lobed or -partite, lobes with often a tuft of hair behind the anthers. *Stamens* at many as and opposite the perianth-lobes, adnate above, rarely at its base; filaments filiform or broad; anthers 2-celled, bursting inwards or laterally. *Disk* epigynous or perigynous. *Ovary* usually inferior and 1-celled, style usually short, stigma entire or 3-6-lobed; ovules 2-3, adnate to or pendulous from a central column, rarely solitary and basal. *Fruit* a nut or drupe. *Seed* globose or ovoid, smooth rugose or sulcate, testa thin or obsolete; albumen copious, fleshy, radicle superior.—Species about 250, in temp. and trop. regions.

OSYRIS, Linn.; Fl. Brit. Ind. v, 231.

Shrubs, Glabrous, branchlets acutely angular. *Leaves* alternate, entire, exstipulate. *Flowers* small, axillary, polygamous; male-flowers in clusters, the bisexual often solitary. *Perianth-tube* solid in the male-flowers, of the bisexual flowers adnate to the ovary; lobes 3-4, triangular, valvate, with a tuft of hairs on the face.

*Stamens* 3 or 4, inserted at the base of the perianth-lobes; anther-cells distinct. *Disk* angular. *Ovary* inferior, sunk in the perianth-tube, style short, stigmas 3-4-fid.; ovules 2-4, pendulous from a short stout central placenta. *Fruit* a globose or ovoid drupe. *Seed* globose, solitary.—Species 5 or 6, in S. Europe, Africa and India.

*O. arborea*, Wall. *Cat.* 4035; *Royle Ill.* 322; *Brandis For. Fl.* 399; *Ind. Trees* 554; *F. B. I. v.* 232; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2), 340; *Gamble Man.* 588; *Collett Fl. Siml.* 442, i, 144; *Cooke Fl. Bomb. ii*, 555.

A large usually glabrous shrub; young branches sharply triangular, puberulous at the tips. *Leaves* subsessile, coriaceous, glaucous, becoming black when dry, 1-2 in. long, elliptic or oblong-lanceolate or obovate-oblong and mucronate, base cuneate. *Flowers* minute, polygamous (male and 2-sexual), yellowish-green. *Male-flowers* shortly stalked, arranged in long-peduncled 5-10 flowered umbels or panicles. *Bisexual flowers* solitary in the axils, the peduncles elongating and drooping in fruit. *Perianth* 3-lobed. *Stamens* 3, opposite the perianth-lobes and alternate with the lobes of the fleshy disk. *Drupe* subglobose,  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., yellow or red when ripe.

Dehra Dun and Siwalik range, and in the Sub-Himalayan tracts eastwards. *Flowers* Dec.-April. *DISTRIB.*: Outer Himalayan ranges from the Sutlej to Bhutan, up to 7,000 ft. (but not in Sikkim); extending to Central and S. India, Ceylon and Upper Burma.

*SANTALUM ALBUM*, Linn.; *Roxb. Fl. Ind. i*, 442; *F. B. I. v.* 231; *Watt Comm. Prod. Ind.* 976; *Brandis Ind. Trees* 553; *Gamble Man.* 585; *Prair. Beng. Pl.* 914; *Cooke Fl. Bomb. ii*, 555.—Vern. *Chandan* (Sandalwood Tree).—A small glabrous evergreen tree with drooping branches. The yellowish-brown strongly-scented heartwood constitutes the well-known sandalwood of commerce. The tree is indigenous in the Western Peninsula southwards from Nasik and the N. Circars, cultivated elsewhere.

### KCIX.—EUPHORBIACEÆ.

Herbs, shrubs or trees, often with milky juice. *Leaves* usually alternate, rarely divided or compound; stipules usually small, caducous or persistent, rarely connate in a bud-protecting sheath, sometimes replaced by glands or thorns. *Flowers* usually small or minute, always 1-sexual; inflorescence various, usually com-



pound, sometimes (in *Euphorbia*) consisting of single naked 1-stamened florets in a perianth-like involucre surrounding a pistil, more often with the main inflorescence centripetal axillary or racemose, the subdivisions cymose, sometimes wholly cymose on terminal dichotomous panicles, or reduced to simple clusters or solitary florets; bracts usually solitary, small and scale-like, sometimes enlarged or 2-3-connate and forming an involucre; bracteoles often 2 within each bract or numerous in the more open cymes. *Perianth* often small, sometimes obsolete, often dissimilar in the two sexes, usually simple, calycine and with the segments valvate or imbricate, sometimes calycine 2-seriate and imbricate with the segments all similar, or occasionally dissimilar and rarely double, the inner then of 4 or 5 scale-like or very rarely conspicuous petals. *MALE*-flowers. Torus sometimes forming an intra-staminal disk or disk-glands or of lobes alternate with the stamens of the outer series. *Stamens* 1-many, free or connate; anthers 2-celled, with longitudinal transverse or porous dehiscence. *FEMALE*-flowers. *Sepals* usually larger and less connate than in the male. *Disk* hypogynous, entire or of distinct glands, or none. *Staminodes* often present. *Ovary* superior, usually of 3 more or less united carpels, styles as many as the carpels, united free or divided, stigmas usually on the inner face of the styles or style-arms; ovules 1-2 in each carpel, pendulous from the inner angle of the cell, the funicle often thickened. *Fruit* usually a capsule of three 2-valved 1-2-seeded cocci separating from a persistent axis, or a drupe with 1-3 cells, or of one or more combined nuts. *Seeds* laterally attached at or above the middle of the cells with or without an aril or caruncle at the hilum; embryo straight, enclosed in fleshy albumen; cotyledons flat, leafy, radicle superior, albumen rarely none and cotyledons fleshy. Species about 4,000, throughout the world, except in Arctic regions, but chiefly tropical.

Flowers monœcious, in heads resembling single flowers consisting of a calyx-like involucre enclosing several flowers without a perianth, viz., many males, each consisting of a solitary pedicelled stamen surrounding a single central female consisting of a 3-carpelled pistil; fruit a capsule.—Herbs shrubs or small trees with milky juice . . . .

1. EUPHORBIA.

Flowers dicecious or monœcious; inflorescence mostly axillary or lateral; perianth of sepals always present and sometimes also petals :—

Stamens of the outer or only series opposite the sepals, or if stamens are all in centre of the flower the cells of the 2-many-carpelled ovary are each 2-ovuled; petals, when present, minute; sepals in one or two series :—

Leaves 3-foliolate, leaflets crenate; fruit a berry.—A large tree . . . . .

2. BISCHOFIA.

Leaves simple, usually entire :—

Male flowers in axillary fascicles or solitary in the axils :—

Corolla of 5 (rarely 6) scale-like petals :—

Ovary 2-celled; fruit indehiscent.—

Trees or scandent shrubs . . . . .

3. BRIDELIA.

Ovary 3-celled; fruit a capsule.—

A small deciduous tree . . . . .

4. CLEISTANTHUS.

Corolla absent in both sexes; sepals imbricate :—

Styles confluent in a column or cone; disk none in either sex; anthers 3-8, adnate to a central column; fruit a capsule.—Evergreen shrubs or trees . . . . .

5. GLOCHIDION.

Styles separate or if partially connate the style-arms and stigmas free :—

Styles or style-arms slender :—

Pistillode in males large; disk present in both sexes; filaments free.—Dicecious shrubs . . . . .

6. FLUGGÆA.

Pistillode absent in males :—

Disk none in either sex :—

Shrubs or small trees . . . . .

7. BREYNIA.

Disk present in the fem. and often in the male flowers ;  
filaments free or united ;  
fruit usually a capsule,  
rarely a berry or drupe.—  
Herbs, shrubs or trees . . . . .

8. PHYLLANTHUS.

Style much dilated ; fruit a 1-seeded  
drupe :—

Stamens 2-4, central.—An ever-  
green tree . . . . .

9. PUTRANJIVA.

Stamens 4-many, surrounding  
a broad disk.—An evergreen  
tree . . . . .

10. CYCLOSTEMON.

Male flowers in axillary paniced spikes  
or racemes ; stamens free round a  
rudimentary pistillode ; fruit a  
drupe.—Trees or shrubs with dicecious  
flowers . . . . .

11. ANTIDESMA.

Stamens of the outer or only series alternate  
with the sepals, or, if stamens are all in  
the centre of the flower the cells of the 2-3-  
(rarely 4-) carpelled ovary are each 1-  
ovuled ; petals, if present, often exceeding  
the sepals :—

Petals present in both sexes ; fruit a cap-  
sule :—

Flowers solitary or clustered on the  
rachis of a terminal raceme.—Trees  
or shrubs, rarely herbs . . . . .

12. CROTON.

Flowers in axillary bracteate racemes ;  
leaves sinuate-toothed or lobed ; fruit  
a capsule.—Hispid or stellately tomen-  
tose herbs . . . . .

13. CHROZOPHORA.

Petals none in either sex ; male sepals 4-5,  
imbricate, free ; fruit a capsule.—A  
stout undershrub . . . . .

14. BALIOSPERMUM.

Male calyx closed in bud, usually mem-  
branous, splitting valvately into 3-5  
concave sepals, the sepals of the fem.  
calyx sometimes imbricate :—

Styles distinct, often, 2-fid. multifid  
or papillosely fimbriate :—

Filaments free :—

Stamens few ; anther cells united  
by their bases only ; styles  
very long, laciniate or fim-  
briate ; fruit a capsule.—

Herbs . . . . . 15. ACALYPHA.

Stamens many ; anther-cells  
attached by a narrow or broad  
connective :—

Leaves opposite ; flowers dice-  
cious, rather large, appearing  
before the leaves ; anther-  
cells oblong ; fruit a drupe.

—A soft-wooded tree . . . 16. TREWIA.

Leaves alternate or opposite ;  
flowers minute, dicecious ;  
anther-cells globose ; fruit  
a capsule.—A small ever-  
green tree . . . . . 17. MALLOTUS.

Filaments connate in bundles or  
branched ; fruit a capsule :—

Flowers dicecious, male and fem.  
in axillary or infra-axillary  
spikes ; seeds with a thin fleshy  
coat ; fruit a capsule.—An  
evergreen willow-like shrub . . . 18. HOMONOIA.

Flowers monœcious, in terminal  
subpanicked racemes, the  
upper ones male and crowded,  
lower fem. ; seeds with a firm  
coat ; fruit a capsule.—A tree-  
like annual herb with palmate  
serrate-lobed leaves . . . 19. RICINUS.

Styles united below in a stout column  
and continuous with the body of  
carpels ; male calyx valvately 3-5-  
partite ; stamens 3 ; fruit a cap-  
sule.—Twinning perennial herbs . . 20. TRAGIA.

Calyx of male flowers open in bud;  
 leaves alternate; stamens 2; styles  
 free or connate at the base; fruit a  
 capsule.—Trees with monœcious  
 flowers in terminal spikes . . . 21. SAPIUM.

1. EUPHORBIA, Linn.; Fl. Brit. Ind. V, 244.

Herbs, shrubs or small trees of various habit and provided with copious milky juice. *Stems* slender and leafy or thick and fleshy, sometimes leafless or nearly so. *Leaves* alternate or opposite, usually entire. *Flowers* monœcious, combined in an inflorescence of many male florets surrounding a solitary female, all enclosed within a small 4-5-lobed turbinate or campanulate perianth-like involucre, involucre-lobes with thick glands at the sinuses, glands with often a petaloid spreading white or coloured limb. *MALE* flowers composed of a simple pedicelled stamen without floral envelopes, anthers 2-celled. *FEMALE* flowers consisting of a 3-celled pedicelled ovary in the centre of the involucre, also without floral envelopes; styles 3, free or connate, stigmas simple or 2-fid. *Fruit* a capsule of three 2-valved cocci separating elastically from a persistent axis and dehiscing ventrally or both ventrally and dorsally. *Seeds* albuminous; cotyledons broad, flat.—Species about 600, chiefly in subtropical and warm temp. regions.

Stems not developed above ground; leaves all radical.—A dwarf perennial glabrous herb . . . 1. *E. acaulis*.

Stems well developed above ground; leaves not all radical:—

Shrubs or small trees with thick fleshy and often prickly branches:—

Branches ascending, armed with pairs of short persistent spines:—

Style-arms 2-cleft; branches prominently 3-6-angled; leaves few, less than 1 in. long, soon falling . . . 2. *E. antiquorum*.

Style-arms undivided:—

Branches prominently 5-7-angled and with flat intervening spaces; leaves 4-6 in. long . . . 3. *E. Royleana*.

Branches terete or 5-angled; leaves many, 6-12 in. long:—

Branches subterete, the spines arising from low distant spirally arranged tubercles . . . . . 4. *E. neriiifolia*.

Branches angular, the spines arising from thick subconfluent tubercles arranged in more or less regular rows . . . . . 5. *E. ligularia*.

Branches spreading, unarmed, cylindric; leaves none or few and small; style-arms 2-lobed, short, recurved . . . . . 6. *E. Tirucalli*.

Annual or perennial herbs with slender erect ascending or prostrate stems, leafy throughout:—

Leaves alternate below and opposite above or all alt. except the uppermost floral leaves, exstipulate; glands of involucre 2-horned, without a petaloid limb:—

Rootstock not proliferous; seeds strophiole:—

Leaves less than 2 in. long; seeds oblong, with a whitish rugose or tuberculate testa.—An annual . . . . . 7. *E. dracunculoides*.

Leaves over 2 in. long; seeds oblong, bluish.—An annual or perennial herb . . . . . 8. *E. Rothiana*.

Rootstock usually with proliferous shoots; seeds globose, smooth, without a strophiole . . . . . 8. *E. prolifera*.

Leaves all opposite, stipulate or, if stipules are absent the leaf-attachments are connected by a transverse interpetiolar raised line; glands of involucre not 2-horned:—

Glands of involucre with a prominent membranous petaloid limb:—

Floral leaves distichously imbricating and concealing the involucre.  
—Erect dichotomously branching herbs clothed with long soft hairs :—

Limb of glands sinuate at the apex,  
rose-coloured . . . . . 9. *E. elegans*.

Limb of glands pectinate . . . . . 10. *E. cristata*.

Floral leaves not distichously imbricating; involucre in many-flowered cymes; leaves serrulate; capsule hairy . . . . . 11. *E. hypericifolia*.

Glands of involucre with a narrow wing or wingless :—

An erect or ascending herb 6-20 in. high, hispid with crisped hairs; leaves  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, acute . . . . . 12. *E. hirta*.

Prostrate herbs; leaves less than  $\frac{1}{2}$  in. long, rounded or retuse at the apex :—

Stems more or less hispidly hairy; capsule pubescent or hirsute :—

Leaves crenulate; capsule pubescent; seeds furrowed . . . . . 13. *E. thymifolia*.

Leaves entire; capsule hirsute; seeds pitted . . . . . 14. *E. granulata*.

Stems and capsule glabrous :—

Leaves about as broad as long; seeds smooth . . . . . 15. *E. microphylla*.

Leaves much longer than their breadth; seeds obscurely transversely rugose . . . . . 16. *E. Clarkeana*.

1. *E. acaulis*, Roxb. *Hort. Beng.* (1814) 36; *Fl. Ind.* ii, 472; *Cooke Fl. Bomb.* ii, 562. *E. fusiformis*, Buch.-Ham. ex Don *Prod.* (1825), 62; *F. B. I.* v, 257; *Prain Beng. Pl.* 923. *E. nana*, Royle *Ill.* 329, t. 82, ff. 2 & 3.—Vern. *Ban muli* (Rohilkhand).



A dwarf unarmed glabrous herb. *Stem* reduced to a long stout underground cylindric rootstock 6-18 in. long or more. *Leaves* all radical, subsessile, fleshy, glabrous, 6-8 in. long, obovate or oblanceolate, obtuse or subacute, base cuneate, margins curled, nerves not showing. *Cymes* from the crown of the rootstock and appearing after the leaves have fallen, dichotomously branched, very variable in length, 3-many-fld.; bracts ovate, or the upper or all truncate and 3-fld.; *Involucres* about  $\frac{1}{4}$  in. long, subsessile or on peduncles of variable length, hemispheric; lobes spatulate, fimbriate. *Capsule*  $\frac{1}{2}$  in. in diam., pedicels  $\frac{1}{2}$  in. long. *Cocci* compressed, styles connate to the middle. *Seeds* broadly ovoid, subacute, smooth.

Siwalik range from Dehra Dun and Saharanpur eastwards along the Sub-Himalayan tracts to N. Oudh and Gorakhpur (Royle, Falconer, T. Thomson, Duthie and others). It flowers during the hot season, and the leaves develop afterwards and fall off during the rains. **DISTRIB.:** Tropical Himalaya up to 1,500 ft. from Garhwal to Nepal and Bengal; also in the Konkan and on the Deccan hills.

**2. E. antiquorum**, Linn. *Sp. Pl.* 450; *Roeb. Fl. Ind.* ii, 468; *Brandis For. Fl.* 438; *Ind. Trees* 558; *F. B. I. v.* 255; *Watt E. D.*; *Comm. Prod. Ind.* 530; *Gamble Man.* 590; *Prain Beng. Pl.* 923; *Cooke Fl. Bomb.* ii, 563.—Vern. *Tidhara-sehnd*.

A large shrub or small tree 15-30 ft.; trunk stout, cylindric or fluted; bark thick, rough, brown; branches many, jointed, fleshy, green, more or less whorled when young, prominently 3-(sometimes 4-6) winged, the wide fleshy wings sinuately repand-crenate, narrowed towards the joints and armed with pairs of persistent spines at the protuberances of the angles. *Leaves* few, soon deciduous, shortly petioled,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, obovate-oblong; tip rounded or subtruncate, crenate; nerves obscure. *Involucres* ternate, forming short peduncled cymes in the sinuses, hemispheric, nearly  $\frac{1}{2}$  in. broad, yellow; the two lateral ones on thick pedicels, the central one sessile and female; bracteoles many, fimbriate. Glands 5, large, broader than long. *Capsule* about  $\frac{1}{2}$  in. in diam.; cocci compressed, glabrous; styles 2-fld.

Occasionally met with in village hedges, and sometimes in gardens as a cultivated plant. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon; also in Burma and the Andaman Islands. It is largely used for hedges, and the wood is believed by Indian peasants to possess the power of warding off lightning strokes. The acrid milky juice supplies remedies for a great variety of ailments.

3. *E. Royleana*, Boiss. in DC. Prod. xv, part 2, 83; Brandis For. Fl. 438; Ind. Trees 558; F. B. I. v, 257; Watt E. D.; Comm. Prod. Ind. 531; Kanjilal For. Fl. ed 2, 343; Gamble Man. 591; Collett Fl. Siml. 446. *E. pentagona*, Royle Ill. 329, t. 82, fig. 1.—Vern. Thor (N. Ind.), *thuor* (Dehra-Dun), *Sihund* (Kumaon).

An erect glabrous fleshy cactus-like shrub up to 16 ft. high and with a girth of usually 2-3 ft., or occasionally up to 5 ft. Branches with 5-7 prominent angles and 5-7 broad flat intervening faces; the spines in pairs on the protuberant portions of the undulating edges. Leaves few, inserted on the angles of the branches, alternate, sessile, soon falling off, 4-6 in. long, spatulate, rounded and shortly mucronate at the apex, tapering to the base; main lateral nerves quite indistinct until dry. Involucres hemispheric, greenish-yellow, about  $\frac{1}{2}$  in. across, arranged 3 or more together in axillary sub-sessile cymes; lobes cuneate, fimbriate. Styles free nearly to the base. Capsules about  $\frac{3}{4}$  in. in diam., trigonous, on pedicels up to  $\frac{1}{2}$  in. long; cocci compressed, glabrous.

Siwalik range, and on exposed rocky slopes on the northern side of Dehra Dun. In flower and fruit during the hot season, the new leaves appearing during the rains. DISTRIB.: Outer ranges of the W. Himalaya from Kumaon to the Jhelum ascending to 6,000 ft.; also on the Salt range of the Punjab. The plant is easily propagated and is often used for hedges; and the white dry wood affords abundant fuel. Although the milky juice of this plant contains a considerable amount of *guttapercha*, the attempts to extract it with profit have hitherto failed. The acrid juice is often used medicinally.

4. *E. nereifolia*, Linn. Sp. Pl. 451; Royle Ill. 328; Cooke Fl. Bomb. ii, 564; *E. Nivulia*, Buch-Ham. in Trans. Linn. Soc. xiv, 286; Wight Ic. 1862; Brandis For. Fl. 439; Ind. Trees 558; F. B. I. v, 255; Kanjilal For. Fl. (ed. 2), 345; Gamble Man. 590; Prain Beng. Pl. 923. *E. nereifolia*, Willd.: Roxb. Fl. Ind. ii, 467. Rheede Hort. Mal. ii, t. 43.—Vern. Thor, *senhur*, *siy*.

A large erect glabrous shrub or small tree up to 20 ft. or more; trunk cork-like when old. Branches fleshy, cylindric, not ribbed, subverticelled, with pairs of sharp persistent spines arising from low conical truncate distant spirally arranged tubercles. Leaves alternate, fleshy, clustered towards the ends of the branches, sessile or nearly so, 4-8 in. long, obovate or obovate-oblong or linear, rounded at the apex and often mucronate, tapering towards the base, deciduous; midrib prominent beneath, lateral nerves obscure. Involucres ternate, form-

ing small shortly peduncled solitary or twin 3-flowered cymes from above the leaf-scars on the tubercles, the central flower of each cyme usually male, sessile, and the first to appear, the 2 lateral ones male or 2-sexual and pedicelled; lobes of involucre large, erect, ovate, fimbriate; glands transversely oblong; bracteoles numerous, fimbriate. *Capsule*  $\frac{1}{2}$  in. broad; styles connate to the middle, undivided. *Seeds* smooth.

Dry rocky hills of Merwara and in the Ajmere country (possibly wild). It is used for hedges in Dehra Dun and probably elsewhere in the Upper Gangetic Plain. The plant flowers and ripens seed during the hot season, and the new leaves appear during the rains. *DISTRIB.*: Outer ranges of N. W. Himalaya on dry exposed rocks; also in Bengal, Sind and Gujarat, extending to S. India and Burma; cultivated elsewhere.

5. *E. ligularia*, Roxb. *Hort. Beng.* 36; *Fl. Ind.* ii, 465; Royle *Ill.* 328; Cooke *Fl. Bomb.* ii, 563. *E. neriifolia*, Dalz. and Gibs. (not of Linn.); *F. B. I.* v, 255; Watt *E. D.*; *Comm. Prod. Ind.* 530; Gamble *Man.* 590; Prain *Beng. Pl.* 923; Brandis *For. Fl.* 439; *Ind. Trees* 558.—Vern. *Sehund*, *mansa-sij*.

An erect fleshy glabrous shrub or small tree up to 20 ft. high. *Branches* scattered, ascending, the younger ones 5-sided and angled and with short sharp black persistent spines arising from thick tubercles which are arranged in 5 irregular rows. *Leaves* alternate, fleshy, from near the ends of the branches, 6-12 in. long, obovate-oblong or subspathulately obovate, acute, deciduous, base narrowed into a short petiole, margins undulate. *Involucre* hemispheric, yellowish, smooth, arranged in small stout dichotomous shortly peduncled 3-15-flowered cymes; the lateral ones of the cymes with short thick pedicels, the central sessile and usually male; lobes large, erect, roundish, fimbriate, glands transversely oblong; bracteoles very many, fimbriate. *Styles* connate above the middle, stigmas capitate. *Capsules* deeply 3-lobed, about  $\frac{1}{2}$  in. broad. *Cocci* compressed, glabrous.

On waste land near villages, but not truly wild within the area of this flora. The leaves drop off in the autumn, the new ones appearing again in May after the plant has flowered. *DISTRIB.*: Rocky places in Orissa, the Deccan, S. India, Ceylon, also in Baluchistan and in the Malay Islands, elsewhere cultivated and often used for fences. The milky juice of this plant is used medicinally, and the root mixed with pepper is regarded as an antidote for snake bites. The plant is sacred to Mansa, the goddess of serpents.

6. *E. dracunculoides*, Lamk. *Encycl. Method.* ii, 428; Roxb. *Fl. Ind.* ii, 474; F. B. I. v, 262; Watt *E. D.*; Prain *Beng. Pl.* 924; Cooke *Fl. Bomb.* ii, 564.

A glabrous dichotomously much-branched annual. *Stems* many, erect, leafy, 12-18 in. high. *Leaves* sessile,  $1\frac{1}{2}$ - $2\frac{3}{4}$  in. long, linear or linear-lanceolate, subacute; base acute, rarely rounded or subcordate; lanceolate, shorter, broader at the base. *Involucres* subsessile, floral leaves shorter, broader at the base. *Involucres* subsessile, solitary, broadly campanulate,  $\frac{1}{10}$  in. across, glabrous outside, hairy within; lobes ovate, ciliate; glands semi-lunate. *Filaments* pubescent. *Capsules* smooth,  $\frac{1}{2}$ - $\frac{1}{3}$  in. diam.; styles free to the base, shortly 2-fid. *Seeds*  $\frac{1}{8}$  in. long, ellipsoid, rounded at the base, grooved on one side and with a strophiole at the oblique depressed apex; testa whitish, leprous, rugose or tuberculate.

N. W. India (Royle), Moradabad (T. Thomson), Sub-Himalayan tracts in Rohilkhand and N. Oudh (Duthie), Bundelkhand (Mrs. Bell). Usually in cultivated ground. Flowers April to June. *DISTRIB.*: Plains of Punjab and Bengal, and southwards to Kanara and Coromandel; also in Arabia and Trop. Africa.

7. *E. Rothiana*, Spreng. *Syst.* iii, 796; F. B. I. v, 263; Cooke *Fl. Bomb.* ii, 564. *E. glauca*, Roxb. *Fl. Ind.* ii, 473.

An erect glaucous annual or perennial herb. *Stem* 1-2 ft. high, glabrous, terete, copiously branched above, often tinged with red; branches slender, some in whorls from the upper axils, others in a whorled umbellate crown from the top of the stem, all again dichotomously branched. *Leaves* of the stem alternate, sessile, 2- $4\frac{1}{2}$  in. long, linear-lanceolate or oblanceolate, acute, mucronulate, entire, glabrous, tapering to the base; leaves beneath the whorled crown of branches 4, sessile, radiating, broader than those of the stem; floral leaves (bracts) beneath the dichotomous forks opposite, broadly ovate or orbicular, acute, mucronate, rounded at the base. *Involucres* solitary in the upper axils and terminal,  $\frac{1}{10}$  in. across, campanulate, glabrous or hairy outside, villous within; pedicels short; lobes subquadrate, ciliate; glands crescent-shaped. *Capsules* about  $\frac{1}{4}$  in. in diam., glabrous; styles  $\frac{1}{10}$  in. long, free almost to the base, 2-fid. at the apex. *Seeds*  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, semicylindric, rounded at the base, grooved on one side and with a fleshy rugulose strophiole at the oblique depressed apex, smooth, bluish-grey when ripe.

Bundelkhand on black soil (Edgeworth). *DISTRIB.*: Hills of Central and Southern India and in the Bombay Presidency; also in Ceylon.

8. *E. prolifera*, Buch.-Ham. ex Don Prod. 62; F. B. I. v, 264; Collett Fl. Siml. 447. *E. cuneifolia*, Roxb. Fl. Ind. ii, 471.

A glabrous perennial herb. *Stems* many, up to 1 ft. high, erect from a stout woody rootstock, often emitting from near the base proliferous barren shoots bearing very narrow acute leaves. *Stem-leaves* alternate, sessile, coriaceous, 1-3 in. long, narrowly linear or linear-oblong or spatulate, obtuse or acute; upper or floral leaves sometimes oblong or ovate; nerves 3, very slender. *Involucres*  $\frac{1}{3}$  in. in diam. shortly campanulate; lobes triangular, fimbriate, glabrous on both sides; glands yellow, stalked, peltate reniform or crescent-shaped, the horns usually short and blunt, the intervening margins entire or toothed, bracteoles many. *Capsule*  $\frac{1}{4}$  in. in diam., smooth; styles connate below the middle. *Seeds* globose, smooth.

Dehra Dun (Gamble), Moradabad (T. Thomson), Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie). *DISTRIB.*: Punjab Plain, Central and W. Himalaya from Nepal to Kashmir ascending to 6,000 ft. in Kumaon, also in China.

9. *E. elegans*, Spreng. Syst. iii, 794; F. B. I. v, 246; Cooke Fl. Bomb. ii, 566.

A dichotomously branched annual, 1-2 ft. high, clothed with long soft spreading hairs. *Leaves* opposite, crowded or in distant pairs, subsessile,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, broadly elliptic-oblong, often obliquely so, obtuse, serrulate towards the tips; stipules minute, setaceous; floral leaves up to  $\frac{3}{8}$  in. long, broadly elliptic or obovate, closely imbricating and forming short spikes at the ends of the branches. *Involucres*  $\frac{1}{4}$  in. long, turbinate, hairy on both sides; limb  $\frac{1}{8}$  in. or more; lobes pink, obovate-cuneate, sinuate at the tip. *Capsule* hairy, cocci globose; styles elongate, 2-fid. *Seeds* quadrangular, transversely grooved, glabrous.

Malwa near Indore, in black soil (Edgeworth). *DISTRIB.*: Central and W. India; found on rocks, and often as a weed of cultivation.

10. *E. cristata*, Heyne ex Roth Nov. Sp. 226; F. B. I. v, 247; Prain Beng. Pl. 924.

An annual herb, clothed with long flexuous hairs. *Stem* slender, 6-10 in. long, prostrate or ascending, dichotomously branched. *Leaves* slightly hairy on both surfaces, opposite, subsessile, membranous,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, obliquely ovate-cordate, obtuse, serrulate upwards, stipules short, subulate. *Floral leaves* suborbicular, distichously

imbricate in a rounded head. *Involucres* subsolitary,  $\frac{1}{2}$  in. in diam., pubescent, throat ciliate, lobes linear-lanceolate, limb of glands pectinately lacinate and fimbriate. *Cocci* globose. *Seeds* with 3 or 4 parallel furrows, white.

Bundelkhand (Duthie) usually in cultivated ground; C. India at Mandu (Edgeworth). This latter locality is just within the southern boundary of the area of this flora. *DISTRIB.*: W. Behar, S. India, Ceylon and extending to Ava.

11. *E. hypericifolia*, Linn. *Sp. Pl. ed. 1*, 454; *F. B. I. v*, 249; *Watt E. D.*; *Collett Fl. Siml. 445*, fig. 145; *Prain Beng. Pl. 924*; *N. E. Brown in Fl. Trop. Afr. vi*, 498; *E. pilulifera*, Linn. *l. c.* *E. indica*, Lamk. *E. uniflora*, Roxb. *Fl. Ind. ii*, 472. *E. parviflora* Roxb. *l. c.*

An erect decumbent annual, 3-18 in. long, branching at the base, glabrous or puberulous. *Leaves* shortly stalked, opposite,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, very variable in shape from linear-oblong to elliptic-ovate, subacute to rounded or retuse at the apex; base obliquely rounded or cordate; margins minutely serrulate, rarely entire, puberulous or glabrous on one or both sides; stipules minute or none. *Cymes* axillary,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., laxly few-flowered or densely many-flowered; peduncles  $\frac{1}{10}$ - $\frac{3}{4}$  in. long, often with a pair of leaves at the apex. *Involucres* very minute, cup-shaped; glands orbicular or transversely elliptic, entire, green, bordered by a conspicuous white or pink rounded limb. *Capsule*  $\frac{1}{16}$  in. in diam., pubescent or glabrous; styles short, deeply bifid. *Seeds* ellipsoid, 4-angled, transversely rugose, reddish-brown with a glaucous hue.

Abundant within the area of this flora as a weed in waste places, flowering all through the year. *DISTRIB.*: Throughout the hotter parts of India, ascending to 4,500 ft. on the Himalaya; widely dispersed in all warm regions.

12. *E. hirta*, Linn. *Sp. Pl. ed. 1*, 454; *Roxb. Fl. Ind. ii*, 472; *N. E. Brown in Fl. Trop. Afr. vi*, 496. *E. pilulifera*, Jacq. (not of Linn.); *F. B. I. v*, 250; *Watt E. D.*; *Comm. Prod. Ind. 531*; *Prain Beng. Pl. 925*; *Cooke Fl. Bomb. ii*, 568.

An annual with erect or ascending stems up to 2-ft. high, clothed with long often yellowish crisped hairs; branches often 4-angled. *Leaves* opposite, shortly stalked,  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. long, elliptic-oblong obovate or oblong-lanceolate, acute or subacute, dentate or serrulate, dark-green



above, pale beneath; base narrow, obliquely cordate; main nerves few, distinct; stipules pectinate, soon falling. *Involucres* many, stalked, less than  $\frac{1}{10}$  in. long, crowded in small axillary shortly stalked cymes; glands minute, globose, limb very small or obsolete. *Capsule*  $\frac{1}{10}$  in. in diam., appressedly hairy. *Seeds*  $\frac{1}{10}$  in. long, ovoid, trigonous, minutely rugose, reddish-brown.

An abundant weed within the area of this flora, flowering during the greater part of the year. *DISTRIB.*: Throughout the hotter parts of India; also in Ceylon and in nearly all tropical and subtropical regions. The plant has medicinal properties similar to those of *E. thymifolia*.

13. *E. thymifolia*, Linn. *Sp. Pl.* 454; *Roxb. Fl. Ind.* ii, 473; *F. B. I.* v, 252; *Watt E. D.*; *Collett Fl. Siml.* 446; *Prain Beng. Pl.* 925; *Cooke Fl. Bomb.* ii, 569.

A small annual herb, more or less hispidly pubescent, the whole plant often with a pale coppery tinge. *Stems* prostrate, and usually closely flattened on the ground, 4-12 in. long, divaricately branched, slender, cylindric. *Leaves* very small, opposite, petioled,  $\frac{1}{8}$ - $\frac{1}{4}$  in. long, obliquely oblong, obtuse, crenulate, glabrous above, glaucous and usually slightly pubescent beneath; stipules elongate, fimbriate. *Involucres* minute, axillary, solitary or 2-3 together in the axils, campanulate, very shortly stalked; glands very minute or none, limb none. *Capsules* erect, shortly stalked,  $\frac{1}{16}$  in. broad, obtusely keeled, pubescent. *Seeds*  $\frac{1}{10}$  in. long, quadrangular, bluntly pointed and with 5-6 shallow transverse furrows.

Very common within the area, and often a conspicuous garden weed especially on gravel-walks, flowering during the greater portion of the year. *DISTRIB.*: Throughout the greater part of India and in Ceylon, ascending to over 5,000 ft. on the Himalaya. It is found also in all hot countries except Australia. The leaves and seeds are said to be aromatic and astringent and the juice acts as a violent purgative. Trimen remarks that the severed end of a branch made to touch lightly the surface of water has the singular effect of violently repelling all floating particles in the neighbourhood.

14. *E. granulata*, Forsk. *Ægypt.-Arab.* 94; *F. B. I.* v, 252; *Watt E. D.*; *Prain Beng. Pl.* 925; *Cooke Fl. Bomb.* ii, 569.

A small hispidly hairy prostrate perennial herb. *Branches* many, 3-6 in. long, very brittle. *Leaves* opposite, shortly petioled, coriaceous,  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, obliquely oblong or obovate-oblong, rounded or retuse



at the apex, quite entire, villous on both surfaces; base narrow, rounded or subcordate; stipules minute, ciliolate. *Involucres* very minute, axillary and on short leafy branchlets, subsessile, turbinate; glands usually without a limb. *Capsule*  $\frac{1}{8}$  in. in diam., cocci hirsute, not keeled; styles very short, 2-fid. *Seeds*  $\frac{1}{30}$  in. long, 4-angled, bluntly pointed, faintly pitted, testa mucous when moistened.

Jumna ravines near Agra (Duthie); Chambal ravines near Etawah (Duthie); Rohilkhand, Bundelkhand and Malwa (Edgeworth).  
DISTRIB.: Plains of Punjab and Sind, Chota Nagpur and in S. India; extending to Afghanistan, Arabia, Egypt and the Canary Islands. The leaves are said to be often used as a pot-herb.

**15. E. microphylla**, Heyne ex Roth Nov. Pl. Sp. 229; F. B. I. V, 252; Watt E. D.; Prain Beng. Pl. 925; Cooke Fl. Bomb. ii, 570. E. Chamæsyce, Willd.; Roxb. Fl. Ind. ii, 473.

A subglabrous annual, or perennial (according to Roxburgh). *Stems* many, prostrate, very slender, spreading from the root and dichotomously branched, pale, glabrous, brittle. *Leaves* opposite, coriaceous,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long and about as broad, obliquely oblong rounded-oblong or subquadrate, rounded truncate or retuse at the apex, entire or toothed only at the broad end, margins often pink; stipules minute, triangular, 2-partite or laciniately toothed. *Involucres* axillary, subsolitary, minute, very shortly stalked, broadly campanulate, glabrous; lobes triangular, apiculate; glands very shortly stalked and with a very small limb. *Capsule* glabrous,  $\frac{1}{16}$  in. in diam., obtusely keeled; styles short, deeply 2-fid. *Seeds* less than  $\frac{1}{30}$  in. long, obtusely 4-angled, blunt at the apex, pale-brown, smooth, mucous when moistened.

Bundelkhand (Edgeworth); Sub-Himalayan tracts of N. Oudh in the districts of Gonda, Bahraich and of Gorakhpur (Duthie); on the banks of the Ganges (Madden). DISTRIB.: Bengal, Behar, Konkan, Madras, extending to Burma and Java.

**16. E. Clarkeana**, Hook. f. F. B. I. v, 253; Cooke Fl. Bomb. ii 570. E. granulata, (Herb. Royle). E. Heyneana, Boiss. (in part).

A glabrous annual. *Stems* many, 3-8 in. long, usually prostrate and spreading. *Leaves* opposite,  $\frac{1}{4}$ - $\frac{3}{8}$  in. long, very shortly stalked, dichotomously spreading, coriaceous and glabrous, often crowded towards the ends of short branchlets, obliquely linear-oblong, entire or toothed at the rounded apex, glabrous, base almost auricled on one side; stipules rather large, setaceous from a broad toothed base. *Involu-*

*eres* axillary, solitary,  $\frac{1}{30}$  in. long, campanulate, glabrous; lobes lanceolate, toothed; glands minute, without a limb. *Capsule* glabrous,  $\frac{1}{16}$  in. in diam., cocci keeled. *Seeds*  $\frac{1}{16}$  in. long, acutely 4-angled and with a blunt point, obscurely transversely rugose, pale-brown, mucous when moistened.

Jumna ravines in the Meerut district (Duthie). *DISTRIB.*: N. W. India (Royle), and from Delhi to Lahore (Herb. Kew); also in Sind and the W. Peninsula.

*E. TIRUCALLI*, Linn.; Roxb. *Fl. Ind.* ii, 470; Brandis *For. Fl.* 439; *Ind. Trees* 558; *F. B. I.* v, 254; Watt *E. D.*; *Comm. Prod. Ind.* 531; *Prain Beng. Pl.* 924; *Gamble Man.* 591; *Cooke Fl. Bomb.* ii, 570.—Vern. *Sehnd.* Usually known to Europeans as the "Milk-bush". A shrub or small tree up to 20 ft. high, with very smooth spreading terete rush-like almost leafless branches. Originally introduced from Tropical E. Africa the plant has become naturalized in many of the drier parts of India. It is a very useful hedge-plant, for by reason of its acrid milky juice cattle refuse to touch it. The wood is not attacked by insects, and being fairly strong and close-grained it is often used for rafters, also a good charcoal suitable for blasting powder can be prepared from it.

*E. PULCHERRIMA*, Willd. Is the well-known *Poinsettia* so extensively grown in gardens throughout the hotter parts of India on account of its large, very handsome crimson or whitish upper floral leaves. It is a native of Mexico.—*Poinsettia pulcherrima*, R. *Grah.*

*E. SPLENDENS*, Boj. Is a small very prickly and much-branched shrub with very showy crimson flowers. It is largely grown in the gardens of Upper India and makes a pretty hedge. It is a native of Madagascar.

*E. GENICULATA*, Orteg. Is an annual herb introduced from Trop. America. It is often met with as a weed in Indian gardens. The narrow floral leaves are green towards the apex and almost white near the base.

## 2. BISCHOFIA, Blume; Fl. Brit. Ind. V, 344.

A large tree. *Leaves* alternate, 3-foliolate, leaflets often crenate. *Flowers* minute, dioecious, in axillary or lateral paniced racemes; males scattered or clustered, the females with longer pedicels.

*Petals* and disk none. *MALE-flowers.* *Sepals* 5, concave, obtuse, imbricate, concealing the anthers. *Stamens* 5, filaments short, anthers large, cells parallel. *Pistillode* short, broad. *FEMALE-flowers.* *Sepals* 5, ovate, caducous. *Staminodes* small or none. *Ovary* exserted, 3-4-celled; styles long, stout, entire, stigmatic on the inner face, ovules 2 in each cell. *Fruit* a globose fleshy berry with 3-4 cells, lined with a parchment-like 2-valved endocarp. *Seeds* turgidly oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat; radicle straight, elongate.—A single species, confined to India and China and to the Malay and Pacific Islands.

**B. javanica**, Blume Bijdr. 1168; Brandis For. Fl. 446; Ind. Trees 558; F. B. I. v. 345; Watt E. D.; Kanjilal For. Fl. (ed. 2) 351; Gamble Man. 607; Frain Beng. Pl. 926; Cooke Fl. Bomb. ii, 571. *Andrachne trifoliata*, Roxb. Fl. Ind. iii, 728; Royle III. 327.—Vern. *Kain*, *kein* (Hind.), *paniāla* (Dehra Dun), *irum* (Oudh).

A large very handsome quick-growing deciduous tree; trunk erect, 30-40 ft. high and often of considerable girth; bark rough, dark-grey; branches spreading, forming a large shady oval head. *Leaves* alternate; common petiole 3-6 in. long, terete; leaflets 3-6 in. long, elliptic, acuminate, crenate, glabrous; main lateral nerves 6-8 pairs; stalks of the lateral leaflets  $\frac{3}{8}$  in., that of the terminal leaf up to  $1\frac{1}{2}$  in. long, channelled; stipules and stipels caducous. *Flowers* greenish-yellow, arranged in slender axillary and lateral peduncled racemes. *MALE-flowers* on very short slender pedicels. *Sepals*  $\frac{1}{10}$  in. long, *Anthers* globular. *Fem.-flowers* on pedicels longer and stouter than those of the male and elongating in fruit. *Sepals*  $\frac{1}{10}$  in. long, not persistent. *Styles* nearly  $\frac{1}{2}$  in., linear. *Fruit*  $\frac{1}{4}$ - $\frac{1}{2}$  in. in diam., reddish-brown when ripe. *Seeds*  $\frac{1}{4}$  in. long, brown, shining.

Moist shady ravines and in swampy places in Dehra Dun and eastwards along the Sub-Himalayan tracts, common in the forests of Gonda and Gorakhpur. The new leaves appear in February and March, and they turn red before falling. It flowers during April and May. **DISTRIB.:** Outer ranges of Himalaya from Kumaon eastwards; also in Assam, Burma, Bengal, W. Ghats and southwards to the Nilgris, but not in Ceylon; found also in the Malay and Pacific Islands. The reddish close-grained wood is much valued for its durability under water and is largely used in the making of bridges and in some parts of India for boat-building.

3. **BRIDELIA**, Willd.; Fl. Brit. Ind. V, 267.

Shrubs or trees. *Leaves* alternate, quite entire, sometimes with strong straight nerves and prominent veins. *Flowers* small or minute, monœcious or dicecious, arranged in axillary or spicate clusters, sessile or very shortly pedicelled; bracts small, scale-like. **MALE-flowers** numerous. *Perianth* double. *Calyx*-segments 5, valvate. *Petals* 5, short, scale-like, stalked or spatulate. *Disk* broad, pulvinate or adnate to the calyx-tube. *Stamens* 5; filaments united below in a column which bears a terminal pistillode, free and spreading above; anther-cells 2, parallel. **FEMALE-flowers** few or solitary. *Calyx-segments* usually narrower than in the male. *Disk* double, the inner forming a membranous central truncate cone often enclosing the young ovary. *Ovary* 2 (rarely 3)-celled, glabrous; styles free or shortly united below, forked or subentire. *Fruit* a small drupe with one or two usually 1-seeded cocci or pyrenes. *Seed* with usually fleshy sometimes membranous albumen, cotyledons thin or fleshy.—Species about 30, in Trop. Asia, Africa and Australia.

Flowers dicecious; leaves deciduous; main lateral nerves 15-20 pairs, straight, prominent; drupe globose.—A small tree with stout more or less persistent spines . . . 1. *B. retusa*.

Flowers monœcious; leaves persistent; nerves more or less arching:—

*Leaves* glabrous or slightly tomentose beneath, but not glaucous; main lateral nerves 10-15 pairs; calyx in fruit not enlarged; drupe fusiform.—A small tree . . . 2. *B. montana*, var. *communis*.

*Leaves* pubescent beneath, or if at length glabrous then glaucous beneath; main lateral nerves 6-9 pairs; calyx in fruit distinctly enlarged; drupe oblong.—A scandent sometimes spinose shrub . . . 3. *B. stipularis*.

1. *B. retusa*. Spreng. Syst. Veg. iii, 48; Brandis For. Fl. 449, t. 55; Ind. Trees 560; F. B. I. v, 268; Watt. E. D.; Kanjilal For. Fl. (ed. 2) 345; Gamble Man. 595; Prain Beng. Pl. 927; Cooke

*Fl. Bomb. ii*, 572. *B. spinosa*, Willd.; Roxb. *Fl. Ind. iii*, 735.—*Vern. Káj, kája* (Hind.), *lamkana* (Ajmir), *gaya* (Dehra Dun).

A small or moderate-sized erect deciduous tree, more or less spinescent when young; bark grey. *Leaves* coriaceous, elliptic-oblong, ovate or obovate, acute, obtuse or rounded at the apex, the base usually rounded, bright-green and glabrous on the upper surface and turning pinkish-purple before falling, often finely tomentose beneath; main lateral nerves 15-25 pairs, straight, prominent, finely reticulate between; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in. long, stipules ovate-lanceolate, unequal at the base, deciduous. *Flowers* diœcious, greenish-yellow, sessile or shortly pedicelled, arranged in dense axillary clusters or in long axillary or terminal panicle spikes exceeding the leaves; bracts small, obtuse, villous. *Calyx*  $\frac{1}{2}$  in. in diam.; lobes fleshy, spreading, triangular-ovate, acute, glabrous and often tinged with red; tube pubescent. *Petals* of males obovate, pectinate; of the fem. sub-spathulate. *Disk* of male flower thick and pulpy; of the fem. truncate, enclosing the ovary. *Drupe* fleshy, subglobose,  $\frac{1}{2}$  in. in diam., seated on the persistent hardly enlarged calyx, flesh-coloured or purplish-black when quite ripe.

Siwalik range (T. Thomson); forests of Dehra Dun and Saharanpur, often associated with *sál*; plentiful in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur; also in Bundelkhand and Rajputana. Flowers May-July, and the fruit ripens in the cold season. *DISTRIB.*: Outer Himalayan ranges from Kashmir to Mishmai up to 3,500 ft., and southwards to S. India and Ceylon, extending to Burma and Malacca. The wood is much valued for various purposes, and it lasts well under water; the bark is used for tanning, the sweetish fruit is eaten, and the leaves afford good fodder for cattle. An earlier name for this plant under *Bridelia* is *B. spinosa*, Willd.—See Cooke *Fl. Bomb. l. c.*

2. *B. montana*, Willd. *Sp. Pl. iv*, 978, var. *communis*, Frain *Beng. Pl. 928*. *B. montana*, Royle *Ill. 327* (not of Willd.); Brandis *For. Fl. 450*; *Ind. Trees 560*, *F. B. I. v*, 269; Watt *E. Di. Kanjilal For. Fl. (ed. 2) 346*; Gamble *Man. 596*; Collett *Fl. Sim. 448*.—*Vern. Gondni* (Saharanpur).

A small or moderate-sized glabrous deciduous tree; trunk short, with a low spreading crown; bark dark-grey; branchlets often warted. *Leaves* membranous, very variable, 4-7 in. long, obovate-oblong or broadly obovate, obtuse acute or abruptly mucronate, entire, often shining above, paler beneath, but not glaucous; main lateral nerves

8-15 pairs, slightly arched; petioles  $\frac{1}{10}$ - $\frac{1}{8}$  in. long, stipules deciduous. *Flowers* monœcious, small, greenish-yellow, shortly pedicelled and arranged in dense axillary clusters; bracts many, very short, ciliate. *Calyx*  $\frac{1}{8}$ - $\frac{1}{6}$  in. in diam.; lobes triangular-ovate, not enlarging in fruit. *Petals* broadly ovate, entire. *Fruit*  $\frac{1}{8}$  in. long, ovoid-oblong or fusiform.

Dehra Dun and in the ravines of the Siwalik range; forests of N. Oudh. Flowers in April and May. **DISTRIB.:** Along the base of the W. Himalaya from the Jhelum to Kumaon, ascending to 4,000 ft.; also in Bengal the Khasia Hills and in Upper Burma. The foliage is lopped for cattle-fodder.

**3. B. stipularis** Blume Bijdr. 597; Brandis For. Fl. 449; Ind. Trees 560; F. B. I. v. 270; Watt E. D.; Gamble Man. 596; Frain Beng. Pl. 928; Cooke Fl. Bomb. ii, 573. *B. scandens*, Willd.; Roxb. Fl. Ind. iii, 736.—Vern. *Madlatah*, *undergupa* (Oudh).

A large more or less scandent evergreen shrub with dark-grey or brownish bark. *Stem* 2-8 in. in diam.; branches often with long deflexed spines, the young shoots pubescent or fulvous-tomentose. *Leaves* subcoriaceous, 2-6 in. long, elliptic-oblong or obovate, obtuse or subacute, rounded or cordate at the base, glabrous or puberulous above, fulvous-tomentose beneath, margins sometimes undulate or repand; main lateral nerves 8-12 pairs, slightly arching, the transverse veins parallel and at right angles, petioles  $\frac{3}{8}$  in. long. *Flowers* monœcious, greenish-yellow, in small dense axillary clusters or long spikes which are often subtended by hairy obliquely ovate-lanceolate acute stipule-like bracts  $\frac{1}{8}$  in. long; male-flowers sessile; females pedicelled, pubescent or glabrate. *Calyx*  $\frac{1}{8}$  in. in diam., distinctly enlarging in fruit; lobes connate below, lanceolate-acuminate. *Petals*  $\frac{1}{10}$  in. long, suborbicular, shortly cuneate at the base, crenulate towards the apex. *Drupe* nearly  $\frac{1}{2}$  in. long, oblong, obtuse, smooth, bluish-black and juicy when ripe.

Sub-Himalayan tract, abundant in the *sâl* forests of Oudh and Gorakhpur. **DISTRIB.:** Throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Peninsula and Islands. The earliest name of this plant under *Bridelia* is *B. scandens*, Willd.—See Cooke Fl. Bomb. l. c.

#### 4. CLEISTANTHUS. Hook. f; Fl. Brit. Ind. v, 274.

Trees or shrubs. Leaves alternate, bifarious, entire. *Flowers* monœcious, small or minute, in axillary clusters or spikes, all sessile



or the females shortly pedicelled. MALE flowers: Calyx-segments 5, valvate. *Petals* 5, short, scale-like, stalked or spatulate. *Disk* broad, entire or sinuate. *Stamens* 5; filaments connate below in a central column, bearing a pyramidal or 3-lobed pistillode, free and spreading above; anther-cells parallel. FEM.-flowers: *Calyx* less deeply lobed than in the male, cupular under the ovary. *Disk* double, the inner conic or turbinate, more or less enclosing the young ovary. *Ovary* 3 (rarely 4) -celled, usually clothed with long hairs; ovules 2 in each cell; styles 3, free, 2-fid. *Fruit* a sessile or stipitate subglobose or depressed capsule with three 2-valved cocci. *Seeds* without an aril or arillode; albumen copious or scanty; cotyledons thin or fleshy, often folded.—Species about 30, in Tropical India, Malaya and Africa.

**C. collinus**, Benth. in Gen. Pl. iii, 268; *F. B. I. v* 274; *Gamble Man.* 597; *Brandis Ind. Trees* 561; *Prain Beng. Pl.* 928. *Lebidiocropsis orbicularis*, Muell.-Arg.; *Brandis For. Fl.* 450; *Watt E. D. Cluytia collina*, Roxb.; *Fl. Ind. iii*, 732.

A small tree with a dark rough bark; branches stiff, smooth or pustulate. *Leaves* coriaceous,  $1\frac{1}{2}$ -4 in. long, orbicular broadly obovate or elliptic, rounded or retuse at the apex, glaucous beneath, pale when dry; main lateral nerves 5-8 pairs, very slender; petiole  $\frac{1}{2}$  in., slender. *Flowers* in small axillary and shortly spicate villous clusters. *Calyx*  $\frac{1}{2}$  in. in diam., ovate-lanceolate. *Petals* narrow, fleshy, incurved. *Disk* of male-flowers pulvinate; of the females conical with a thick margin. *Ovary* globose, glabrous; styles free, thick, stigmas lobed. *Capsule* sessile, rounded,  $\frac{3}{8}$  in. in diam., obscurely 3-lobed, dark-brown, shining and wrinkled when dry. *Seeds*  $\frac{1}{4}$  in. in diam., globose, reddish-brown.

Forests of Bundelkhand. Flowers in June, and the fruit ripens during the cold season. **DISTRIB.**: From the C. Provinces, Chota Nagpur and Circars to S. India and Ceylon. The hard and tough dark-coloured wood is much valued for posts and poles. The capsules, as well as the leaves and roots, are said to be very poisonous.

### 5. GLOCHIDION, Forst.; *Fl. Brit. Ind. v*, 305.

Evergreen trees or shrubs. *Leaves* alternate, bifarious, shortly petioled, entire. *Flowers* small, in axillary clusters, monœcious or diœcious. *Perianth* simple. *Petals* none. *Disk* none. MALE-



flowers : *Sepals* 6, rarely 5, spreading, in 2 series, imbricate. *Stamens* connate in an ellipsoid or oblong sessile column ; anthers 3-8 (or more), cells linear, bursting outwards, connectives produced as free points or connate in an umbonate head. *Pistillode* none or rarely minute. FEMALE-flowers : *Calyx* usually of 6 short imbricate sepals, or shortly tubular and unequally toothed or cleft. *Ovary* 3-15-celled ; styles connate in a globose conic or subclavate column lobed or toothed at the tip, ovules 2 in each cell. *Fruit* a capsule of three or more 2-valved cocci, often with twice as many lobes as cells, globose or orbicular and depressed or intruded at the base and apex, crowned by the enlarged style ; cocci coriaceous or crustaceous, the epicarp separable or not. *Seeds* hemispherical or laterally compressed, testa crustaceous and with often a succulent coat ; albumen copious, fleshy, cotyledons flat.—Species 135, in Asia and Polynesia.

Anthers 4 or more ; leaves glabrous beneath :—

Pedicels of male flowers stout, about  $\frac{1}{2}$  in.

long ; leaves glaucously purplish beneath 1. *G. multiloculare*.

Pedicels of male flowers filiform,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long ;

leaves pale-green beneath . . . 2. *G. lanceolarium*.

Anthers 3 ; leaves softly tomentose beneath . 3. *G. velutinum*.

1. *G. multiloculare*, Voigt Hort. Suburb. Calc. 152 ; F. B. I. v, 307 ; Gamble Man. 601 ; Prain Beng. Pl. 930 ; Brandis Ind. Trees, 572. *Bradleya multilocularis*, Spreng. ; Roxb. Fl. Ind. iii, 696.

An evergreen shrub or small tree with usually drooping branches, branchlets angular, glabrous or puberulous. *Leaves* thinly coriaceous, purplish-brown, 3-5 in. long, oblong, linear-oblong or obovate, obtuse or subacute, apiculate, lower surface glaucous ; main lateral nerves 5-8 pairs and with many prominent transverse veins between ; petioles stout,  $\frac{1}{10}$  in. long, stipules triangular-ovate, cuspidate. MALE-flowers small ; pedicels stout,  $\frac{1}{2}$  in. long. *Perianth*  $\frac{1}{2}$  in. in diam. *Sepals* oblong. *Anthers* 4-12, adnate to the middle, connectives very short. FEM.-flowers  $\frac{1}{2}$  in. in diam., stoutly pedicelled. *Ovary* 10-15-celled ; style low, slightly furrowed. *Capsule* orbicular,  $\frac{3}{4}$ -1 in. in diam. ; epicarp thin, reddish, separating from the coriaceous cocci. *Seeds* persistent on the axis, furnished with a fleshy orange-red coat.

Abundant in the grass-lands of the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. **DISTRIB.:** N. Behar, Sikkim Terai, Assam, Sylhet and Upper Burma.

**2. *G. lanceolarium*, Voigt Hort. Suburb. Calc. 153; F. B. I. v, 308; Watt E. D.; Kanjilal For. Fl. (ed. 2), 348; Gamble Man. 601; Prain Beng. Pl. 930; Cooke Fl. Bomb. ii, 577; Brandis Ind. Trees 573.** *Phyllanthus lanceolarius*, Muell. Arg.; Brandis For. Fl. 453. *Bradleia lanceolaria*, Roxb. Fl. Ind. iii, 697.

A small or medium-sized glabrous evergreen tree; bark grey, with longitudinal wrinkles; branchlets angular, glabrous. *Leaves* coriaceous, glabrous and shining, 3-6 in. long, elliptic-oblong or lanceolate, acuminate, pale-green beneath, base acute, decurrent on the petiole; main lateral nerves 6-10 pairs, slender; petioles  $\frac{1}{2}$ - $\frac{1}{4}$  in., stout, channelled; stipules triangular, acuminate. *Flowers* pale-green. **MALE**-flowers many, glabrous, on filiform pedicels  $\frac{1}{2}$ - $\frac{1}{4}$  in. long. *Sepals*  $\frac{1}{2}$  in. long, linear-oblong. *Anthers* 4-6; connectives  $\frac{1}{2}$  the length of anthers, acute. **FEM.**-flowers smaller, few, sessile or nearly so, mostly in the upper axils, a few mixed with the males. *Sepals* unequal, lanceolate, acute, rigid, glabrous. *Ovary* hairy, 6-8-celled; style shortly exserted, glabrous near the toothed apex. *Capsule* hoary, about  $\frac{3}{4}$  in. in diam., orbicular, depressed, usually 6-8-lobed. *Seeds* often persistent on the axis.

Dehra Dun, fairly common in swampy places and in moist shady ravines; also in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. It flowers during the cold season. **DISTRIB.:** Outer Himalayan ranges from Kumaon and Nepal eastwards, up to 4,000 ft.; also in Chota Nagpur, Bengal and Assam, extending to the Shan Hills and Upper Burma. Roxburgh states that it sometimes grows to be a large tree with hard and durable wood. The seeds yield an oil for burning, and the bark is used medicinally.

**3. *G. velutinum*, Wight Ic. t. 1907-2; F. B. I. v, 322; Watt E. D.; Kanjilal For. Fl. (ed. 2), 348; Gamble Man. 602; Collett Fl. Siml. 451; Prain Beng. Pl. 931; Cooke Fl. Bomb. ii, 578; Brandis Ind. Trees 574.** *Phyllanthus nepalensis*, Muell. Arg.; Brandis For. Fl. 453.—Vern. *Chamári* (Dehra Dun).

A small or moderate-sized tree; young branches petioles under surface of leaves and inflorescence clothed with soft velvety pubescence. *Leaves* thinly coriaceous, 2-4 $\frac{1}{2}$  in. long, from orbicular to elliptic-oblong or lanceolate, obtuse acute or acuminate, base usually rounded, upper surface puberulous or glabrate; main lateral nerves 6-8

pairs, prominent beneath, transverse veins distinct; petioles stout,  $\frac{1}{2}$ - $\frac{1}{10}$  in.; stipules triangular, cuspidate. *Flowers* small, greenish-yellow, arranged in axillary clusters, the male and female usually in the same cluster. *MALE*-flowers stalked. *Sepals*  $\frac{1}{2}$  in. long, ovate, sub-acute, keeled and pubescent on the back. *Staminal-column*  $\frac{1}{10}$  in.; anthers 3, connate below, connectives acute. *FEM.*-flowers sessile or nearly so, pubescent. *Sepals* as in male. *Ovary* 4-7-celled, tomentose; style longer than the ovary, enlarged at the truncate 4-7-toothed apex. *Capsule*  $\frac{1}{2}$ - $\frac{1}{4}$  in. in diam., orbicular-depressed, 4-7-lobed. *Seeds* bright-red, often persistent on the tree.

Common in the forests of Dehra Dun and Saharanpur (Kanjilal), and eastwards along the Sub-Himalayan tracts. Flowers from February to April. *DISTRIB.*: Hot valleys of the Outer Himalaya from Kashmir eastward to Sikkim, ascending to 4,000 ft.; also Assam, Khasia Hills and Burma, and from Central India and the Deccan to the Nilgiris. The bark is used for tanning.

#### 6. FLUGGEA, Willd.; Fl. Brit. Ind. v, 328.

Unarmed or spinescent shrubs. *Leaves* small, alternate, distichous, entire. *Flowers* minute, dioecious, axillary, pedicelled, apetalous; males numerous, clustered; females few, in lax fascicles, perianth simple, 5-cleft. *MALE*-flowers: *Sepals* 5, subpetaloid, imbricate. *Petals* none. *Stamens* 5, rarely 4 or 3, alternating with as many disk-glands, filaments free, anthers erect; cells parallel, bursting longitudinally. *Pistillode* 2-3-fid. *FEMALE*-flowers: *Sepals* as in male. *Petals* none. *Disk* flat, annular, toothed. *Ovary* 1-3-celled; styles 3, recurved, usually 2-fid., ovules 2 in each cell. *Fruit* globose, coriaceous, or with a fleshy epicarp, bursting irregularly or into distinct 2-valved cocci. *Seeds* triquetrous, with convex backs and acute faces, testa crustaceous, albumen scanty, embryo curved; cotyledons flat, broad.—Species 6, in the tropics of the Old World.

Unarmed; leaves 1-3 in. long . . . . . 1. *F. microcarpa*.

Spinous; leaves rarely exceeding 1 in. long . . . . . 2. *F. Leucopyrus*.

1. *F. microcarpa*, Blume Bijdr. 580; *F. B. I. v*, 328; Kanjilal For. Fl. (ed. 2), 349; Gamble Man. 603; Collett Fl. Siml. 451; Prain Beng. Fl. 931; Cooke Fl. Bomb. ii, 581; Brandis Ind. Trees 569. *Securinea obovata*, Muell. Arg.; Brandis For. Fl. 455. *Phyllanthus virosus*, Willd.; Roxb. Fl. Ind. iii, 659; Royle Ill. 328 (*Fluggea*).

*P. retusus*, Roxb. l. c. 657 ; Royle Ill. 327 (*Fluggee*).—Vern. *Dalme* (Hind.), rithoul (Dehra Dun).

A large unarmed glabrous shrub or small tree ; bark smooth, thin, rusty or reddish-brown, marked with small lenticular specks ; branchlets slender, angular, compressed. *Leaves* very variable, shortly petioled, thin, glabrous, 1-3 in. long, elliptic or obovate, rounded at the apex, rarely retuse or subacute, base usually acute ; main lateral nerves 5-7 pairs, very slender ; under-surface glaucous and with loose reticulate venation ; petioles slender,  $\frac{1}{8}$ - $\frac{1}{4}$  in. *Flowers* very small, arranged in axillary clusters from a crowd of minute bracts ; the males very many ; the females 1-5, rarely more. MALE-flowers on filiform pedicels. *Sepals* spreading,  $\frac{1}{16}$  in. long, obovate-oblong, obtuse, concave. *Stamens* usually 5, exerted ; filaments opposite the sepals, slender. *Pistillode* large, 3-fid. FEM.-flowers. *Pedicels* shorter than those of males. *Sepals* as in males. *Ovary* glabrous, styles deeply bifid. *Berry* globose, of two sizes, mostly minute and with a dry pericarp, a few  $\frac{1}{2}$  in. in diam. and white with a fleshy pericarp. *Seeds* 3-6, minutely punctate.

Dehra Dun, in scrub forest (Kanjilal), and eastwards along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur ; also in Bundelkhand and Merwara. Flowers in April and May. DISTRIB. : Hilly parts of the Punjab westwards to the Suliman range ; Himalaya from Kashmir to Bhutan up to 5,000 ft., also in Bengal and in Central W. and S. India, extending to Ceylon, Burma, Malaya, China, Australia and Trop. Africa. The hard close-grained reddish wood is used for agricultural implements, and the bark is said to be used for intoxicating fish.

2. *F. Leucopyrus*, Willd. *Sp. Pl.* iv, 757 ; *F. B. I.* v, 328 ; *Gamble Man.* 603 ; *Brandis Ind. Trees* 569 ; *Cooke Fl. Bomb.* ii, 581. *Securinea Leucopyrus*, Muell. Arg. ; *Brand. For. Fl.* 456, t. 54 (in part). *Phyllanthus Leucopyrus*, Koen. Mss. ; *Roxb. Fl. Ind.* iii, 658.—Vern. *Hartho*, *ainta* (Brandis), *salipan* or *halepan* (Merwara).

A large glabrous bush with rigid straggling branches ; branchlets slender, angular, ending in sharp spines. *Leaves*  $\frac{3}{4}$ -1 in. long, rarely longer, obovate obcordate or rotundate, glaucous and with indistinct reticulate venation beneath. *Flowers* as in *F. microcarpa*. *Berry* 3-celled, globose, about  $\frac{1}{4}$  in. in diam., smooth, white when ripe ; styles 3, bifid. *Seeds* 2 in each cell.

In the Sub-Himalayan tracts of Kheri (N. Oudh) and Gorakhpur. Flowers May and June. DISTRIB. : Outer ranges of the Kumaon

Himalaya up to 5,000 ft. ; common also in the Punjab Plain and in Sind, extending to Kanara, the Carnatic, Ceylon and Upper Burma.

**7. BREYNIA**, Forst.; Fl. Brit. Ind. v, 329.

Shrubs or small trees. *Leaves* small, alternate, petioled, entire, often distichous. *Flowers* monœcious, axillary, minute ; pedicels distinct, solitary or the males in fascicles. *Perianth* simple. **MALE**-flowers : *Calyx* turbinate or hemispheric with a truncate limb ; margin often thickened and lobulate opposite the minute inflexed and rounded lobes. *Petals* none. *Disk* none. *Stamens* 3, filaments connate ; anthers slender, adnate to the whole length of the column ; cells linear, parallel, distinct. *Pistillode* none. **FEM.**-flowers : *Calyx* coriaceous, turbinate or rotate ; limb broadly and shortly 6-lobed, often much enlarged and disciform in fruit. *Petals* disk and staminodes none. *Ovary* 3-celled, fleshy above, globose truncate or depressed at the apex ; styles 3, sessile or connate in a short column, each 2-fid. or 2-lobed ; or stigmas 3, minute, simple and immersed in a cavity at the top of the ovary ; ovules 2 in each cell. *Fruit* globose or depressed, more or less succulent, indehiscent or with a 6-valved pericarp enclosing 3-6 imperforate indehiscent cocci. *Seeds* with a membranous testa, hilum without a caruncle, albumen fleshy, cotyledons broad, radicle long.—Species 12, in Trop. Asia, Africa and the Pacific Islands.

**B. rhamnoides** Muell. Arg. in DC. Prod. xv, part 2, 440 ; Brandis For. Fl. 455 ; Ind. Trees 568 ; F. B. I. v, 330 ; Watt E. D. ; Gamble Man. 604 ; Frain Beng. Pl. 933 ; Cooke Fl. Bomb. ii, 533. *Phyllanthus Vitis-Idœa*, Roxb. Fl. Ind. iii, 665.—Vern. Tikkar (Oudh).

A shrub or small tree, quite glabrous. *Bark* rough, yellowish-brown. *Branches* many, horizontal ; branchlets flexuous, angular. *Leaves* many, membranous, distichous, shortly stalked,  $\frac{5}{8}$ - $1\frac{1}{2}$  in. long, elliptic, obtuse or subacute, pale beneath, turning dark-brown or black when dry, base subacute or rounded ; petiole  $\frac{1}{10}$  in. ; stipules  $\frac{1}{5}$  in., subulate from a triangular base. *Flowers* very small, on filiform pedicels, the males usually in small fascicles, females generally solitary. **MALE**-flowers : *Calyx* turbinate or subcampanulate, mouth entire or obscurely lobed. *Staminal column* truncate at the apex and produced beyond the adnate anthers. **FEM.**-flowers. *Calyx* cup-shaped ; hardly enlarged in fruit ; lobes 6, acute. *Ovary* exserted, oblong,

truncate; styles very short. *Fruit* globose, about  $\frac{1}{4}$  in. in diam. smooth, succulent, dull-red or purple.

Sub-Himalayan tracts and in the forests of Oudh and Bundelkhand; abundant in open scrub lands and often met with in hedges. Flowers in April and May. *DISTRIB.*: Throughout tropical India; extending to Ceylon, Burma, China, the Malay Islands and the Philippines.

### 3. PHYLLANTHUS, Linn. ; Fl. Brit. Ind. v, 285.

Herbs, shrubs or trees. *Leaves* distichous, the branchlets with their leaves often resembling pinnate leaves, entire, stipules usually narrow or none. *Flowers* small, monœcious, rarely dicecious, axillary or on the old nodes; males usually many, fascicled, subsessile or pedicelled, rarely few or solitary; females in the same or in distinct axils with longer pedicels, solitary or few; perianth simple. *MALE-flowers*: *Sepals* 4-6, free or nearly so, imbricate, more or less 2-seriate. *Disk* glandular, rarely none. *Stamens* 3, rarely 4 or 5, in the centre of the flower, filaments free or connate, anthers 2-celled, oblong or didymous, rarely reniform; cells parallel or diverging, dehiscence extrorse, vertical or transverse. *Pistillode* none. *FEM.-flowers*: *Sepals* as in male. *Petals* none. *Disk* glandular. *Ovary* usually 3-celled; styles free or connate, usually 2-fid. and with slender arms; ovules 2 in each cell. *Fruit* of 3 crustaceous or coriaceous rarely bony 2-valved cocci, sometimes a 4-celled berry or a drupe with a 3-4-celled bony epicarp. *Seeds* trigonous, testa crustaceous, hilum without a caruncle, albumen fleshy, cotyledons flat or flexuous.—Species about 400 in all warm countries.

Stamens 5, in 2 series, the 3 inner filaments connate.—A shrub, often scandent . . . 1. *P. reticulatus*.

Stamens 3, filaments united in a column, rarely free and recurved:—

Anthers erect, slits vertical, connective usually produced:—

Fruit large, fleshy, containing 3 bony 2-valved cocci; disk absent in the male-flowers; styles connate below, twice 2-fid.—A tree . . . 2. *P. Emblica*.

Fruit a capsule of 3 crustaceous 2-valved cocci; disk present in the male and fem. flowers; styles once 2-fid., free; stipules peltate.—Herbs:—

Leaves scattered, cuneate-obovate; capsule smooth . . . . .

3. *P. maderaspatensis*.

Leaves close-set, distichously imbricating, oblong or linear-oblong; capsule echinate . . . . .

4. *P. urinaria*.

Anthers didymous, reniform, the cells subglobose, slits very short; fruit a capsule; styles once 2-fid., free or connate:—

Seeds finely tubercled; stipules peltate.—

A perennial herb or undershrub . . . . .

5. *P. simplex*.

Seeds with parallel ribs on the back; stipules simple, not peltate.—An annual weed . . . . .

6. *P. Niruri*.

1. *P. reticulatus* Poir. *Encycl. Méth. v*, 298; Brandis *For. Fl.* 453; *Ind. Trees* 570; *F. B. 1. v*, 288; *Watt E. D.; Comm. Prod. Ind.* 887; *Gamble Man.* 598; *Prain Beng. Pl.* 935; *Cooke Fl. Bomb. ii*, 585. *P. multiflorus*, Willd.; *Roxb. Fl. Ind. iii*, 664 (not of Roxb. *1c.*).—Vern. *Panjuli, kabonan* (Merwara).

A large often scandent shrub, glabrous or pubescent; branchlets slender, drooping, smooth or lenticellate; bark thin, greyish-brown. *Leaves* variable, thin, glabrous or nearly so, pale beneath, 1-2 in. long, oblong elliptic or rotundate, obtuse or acute at the apex; base rounded acute or subcordate; main lateral nerves 6-8 pairs, slender; petioles up to  $\frac{1}{2}$  in. long; stipules shorter than the petioles, ovate, acute, sometimes bristle-pointed. *Flowers* axillary, males in fascicles, the females solitary, pedicels slender. *Calyx*  $\frac{1}{10}$  in. long, glabrous; segments oblong, obtuse, alternating with the glands of the disk. *MALE*-flowers. *Stamens* 5, the three inner connate, the two outer free and shorter. *FEM.*-flowers. *Ovary* 5-10-celled; ovules 2 in each cell, superposed; styles 3, minute, 2-lobed. *Fruit* a globose berry, about  $\frac{1}{2}$  in. diam., smooth and shining, dark-purple when ripe. *Seeds* usually 10, trigonous, crustaceous, punctulate.

Meerut (T. Thomson), Rohilkhand (Edgeworth), N. Oudh and Gorakhpur (Duthie); often found climbing amongst bushes and in hedges.



DISTRIB.: Throughout tropical India from Sind, Bengal and Sikkim to S. India and Ceylon; also in Burma, the Andaman Islands, Malay Archipelago, China and Trop. Africa. The leaves bark and juice are used medicinally. Manson states that the charcoal prepared from this species is much used in Burma for lighting hookas.

2. *P. Emblica*, Linn. *Sp. Pl.* 982; Roxb. *Fl. Ind.* iii. 671; Brandis *For. Fl.* 454, t. 52; *Ind. Trees* 570; F.B.I. v. 289; Watt *E. D.; Comm. Prod. Ind.* 886; Kanjilal *For. Fl.* (ed. 2), 346; Gamble *Man.* 599; Collett *Fl. Siml.* 450; *Frain* Beng. *Pl.* 935; Cooke *Fl. Bomb.* ii. 585. *Embllica officinalis*, Gærtn.; *Royle* Ill. 327.—Vern. *Ambla*, *āmla*, *aonhla*, *aola*. (*Emblīc myrobalan*.)

A moderate-sized deciduous tree with usually a crooked trunk; bark light-grey, or greenish, peeling off in small irregular patches, red inside. Branches spreading, branchlets glabrous or finely pubescent, often deciduous. Leaves small, subsessile, distichously arranged along the branchlets and thus simulating the leaflets of a pinnate leaf,  $\frac{3}{4}$ -1 in. long, narrowly linear, obtuse, pale-green, glabrous or puberulous beneath; stipules minute, ovate, finely acute. Flowers greenish-yellow, arranged in axillary fascicles on the leaf-bearing branchlets or on the naked portion below the leaves; bracts fimbriate, MALE-flowers many, shortly pedicelled. Sepals 6, oblong, obtuse,  $\frac{5}{16}$  in. long. Disk none. Anthers 3, erect, on a short column, slits vertical. FEM.-flowers few, subsessile. Sepals as in male. Disk cupular, lacerate. Ovary 3-celled; styles connate at the base, twice 2-fid. and with acute lobes. Fruit fleshy, globose, pale-yellow and often tinged with pink when ripe, about  $\frac{1}{2}$  in. in diam., obscurely 6-lobed, breaking up when dry into three 2-seeded crustaceous cocci. Seeds 6, trigonous.

Abundant in forest tracts within the area of this flora, and often planted near villages and as a roadside tree. Flowers March to May, and the fruit ripens during the cold season. DISTRIB.: Throughout tropical and subtropical India, chiefly in the dry deciduous forests, ascending to 4,500 ft. on the Himalaya; also in Ceylon, Burma, the Malay Islands and China. The acid fruit is eaten as a pickle, and the bark leaves and fruit are used in dyeing and tanning. The hard red wood is valued for poles and, being durable under water, it is much used for well-work. Excellent charcoal is prepared from it. It is said that chips of the wood thrown into muddy water will clear it effectually. For further particulars regarding the medicinal and other useful properties of this tree see Watt's Dictionary.

**3. *P. maderaspatensis*, Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 654; F. B. I. v, 292; Watt E. D.; Frain Beng. Pl. 935; Cooke Fl. Bomb. ii, 586. *P. obcordatus*, Willd.; Roxb. Fl. Ind. iii, 656.— Vern. Hazarmani.**

A glabrous annual but occasionally often with a woody rootstock. *Stems* erect, 1-3 ft., ascending or decumbent below. *Leaves* scattered,  $\frac{1}{4}$ - $1\frac{1}{4}$  in. long, cuneate, ovate, with a rounded truncate or subcordate and mucronate apex, tapering at the base into the very short petiole, glaucous beneath, the lateral nerves few and rather conspicuous; stipules membranous, peltate, acute. *Flowers* axillary; males minute, in small clusters, subsessile; females solitary and longer, shortly stalked. *Sepals* 6, obovate, rounded at the apex, green margined with white. *Stamens* 3, filaments connate; anthers erect and with vertical slits. *Styles* 3, minute, free, 2-lobed. *Capsule*  $\frac{1}{8}$ - $\frac{1}{4}$  in. in diam., depressed-globose, 3-lobed, glabrous. *Seeds*  $\frac{1}{10}$  in., trigonous, rounded on the back, muriculate in fine lines, glabrous.

Dehra Dun (Edgeworth), Malwa, in black soil (Edgeworth). **DISTRIB.:** Drier parts of India from Bengal and C. India to S. India and Ceylon; also in Trop. Africa, Java, China and Australia.

**4. *P. urinaria*, Linn. Sp. Pl. 982; Roxb. Fl. Ind. iii, 660; F. B. I. v, 293; Watt E. D.; Frain Beng. Pl. 935; Cooke Fl. Bomb. ii, 587.**

An annual or rarely perennial, glabrous or nearly so. *Stems* erect; branches few, often tinged with red; branchlets flattened and slightly winged, minutely hispid at the angles. *Leaves* sessile, distichously imbricate,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, oblong or linear-oblong, tip rounded or apiculate, pale beneath, glabrous or the margins minutely hispid; base rounded, usually oblique; stipules peltate, acute from a broad base. *Flowers* minute, solitary, subsessile. *Sepals* green, ciliolate, those of the males suborbicular; of the females oblong, not enlarged in fruit. *Filaments* very shortly connate; anthers erect, the slits vertical. *Capsule*  $\frac{1}{2}$  in. in diam., globose, obscurely lobed, echinate. *Seeds* trigonous, rounded on the back, transversely furrowed.

**5. *P. simplex*, Retz. Obs. Eot. fasc. v, 29; Roxb. Fl. Ind. iii, 654; F. B. I. v, 295; Watt E. D.; Collett. Fl. Siml. 450; Frain Beng. Pl. 936; Cooke Fl. Bomb. ii, 587.**

A glabrous perennial herb or an undershrub, very variable, usually with a long tap-root; branches flattened. *Leaves* many, distichous

and often imbricate, subsessile,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, linear-oblong, obtuse and apiculate; stipules peltate, sagittate, brownish, scarious. *Flowers* usually solitary, on slender or stout pedicels, the females larger than the males. *Sepals* about  $\frac{3}{10}$  in. long, oblong, obtuse, those of the female flowers slightly enlarged in fruit. *Stamens* 3, filaments free; anthers didymous, the slits very short so that when the cells are confluent the dehiscence appears to be transverse. *Styles* short, once 2-fid., free or connate. *Capsule* globose,  $\frac{1}{10}$  in. in diam. obscurely 3-lobed, crustaceous, rough but not echinate. *Seeds* minute, trigonous, rounded on the back, finely tubercled, dark-brown.

Dehra Dun (Gamble), Pilibhit, N. Oudh in the districts of Kheri and Bahraich (Duthie). **DISTRIB.**: Throughout the hotter parts of India and up to 2,000 ft. in Kumaon; also in Ceylon, Malay Islands, China and in the Pacific Islands.

6. *P. Niruri*, Linn. *Sp. Pl.* 941; Roxb. *Fl. Ind.* iii, 659; *F. B. I.* v, 298; Watt *E. D.*; *Comm. Prod. Ind.* 887; *Prain Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 587.—Vern. *Jar-ámila*, *jangli-ámli*.

A glabrous annual, up to 2 ft. high. *Stems* often branching from the base, angular; branchlets slender, spreading. *Leaves* many, subsessile, distichous and often overlapping,  $\frac{1}{4}$ - $\frac{1}{2}$  in. long, elliptic-oblong, obtuse or rarely subacute, glaucous beneath, nerves obscure; stipules lanceolate-subulate, acute. *Flowers* axillary, numerous, very minute, the males solitary or 2-3-nate, the females solitary, on short pedicels. *Sepals* of male flowers  $\frac{1}{10}$  in. long, rounded; those of the female twice as long, oblong, subacute, white-margined, not enlarging in fruit. *Stamens* 3; anthers didymous, on a short column. *Styles* minute, free, 2-lobed. *Disk* of males of minute glands; of females annular, lobed. *Capsule* depressed-globose,  $\frac{1}{10}$  in. in diam., smooth, obscurely lobed. *Seeds* trigonous, rounded on the back and with parallel regular longitudinal ribs.

A common garden weed and in cultivated fields within the area; Dehra Dun (Duthie), Moradabad (T. Thomson), Bundelkhand (Mrs. Bell), etc. *Flowers* in July and August. **DISTRIB.**: Throughout the hotter parts of India, also in Ceylon and in most tropical countries, but not in Australia. The plant is much used as a diuretic by the natives of India.

*P. DISTICHUS*, Muell.-Arg.; *F. B. I.* v, 304; Watt *E. D.*; *Prain Beng. Pl.* 936; *Gamble Man.* 600; *Brandis Ind. Trees* 570; *Cooke Fl. Bomb.* ii, 589. *P. longifolius*, Roxb. *Fl. Ind.* iii, 672. *Cleca disticha*, Linn.;

*Royle Ill.* 327.—A small glabrous deciduous tree with pinnately distichous leaves and small reddish flowers in dense clusters. The acid fruit, about as large as a big gooseberry, is much used in tarts or as a pickle. The tree is a native of the Malay Islands and in Madagascar. It is met with in gardens within the area of this flora and in other parts of India.

9. PUTRANJIVA, Wall.; Fl. Brit. v, 336.

Trees. *Leaves* alternate, evergreen, entire or serrulate, penninerved and reticulate. Flowers monœcious or diœcious, axillary pedicelled; the males clustered, the females subsolitary. *Petals* and *disk* none. MALE-flowers: *Calyx* unequally 3-6-lobed, imbricate. *Stamens* 2-4, in the centre of the flower, filaments free or partially connate; anthers erect, cells parallel. *Pistillode* none. FEM.-flowers: *Calyx* as in male. *Ovary* ovoid, 2-3-celled; styles short, spreading, dilated into broad fleshy arms, ovules 2 in each cell. *Fruit* an ovoid or globose drupe; endocarp hard, 1-celled. *Seed* solitary, ovoid, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 2, India and Ceylon.

*P. Roxburghii*, Wall. *Tent. Fl. Nep.* 61; *Royle Ill.* 347, t. 83 bis; *Brandis For. Fl.* 451, t. 53; *Ind. Trees* 566; *F. B. I.* v, 336; *Watt E. D.*; *Collett Fl. Siml.* 452; *Kanjilal For. Fl.* (ed. 2), 349; *Gamble Man.* 604; *Prair Beng. Pl.* 936; *Cooke Fl. Bomb.* ii, 590. *Nageia Putranjiva*, *Roxb. Fl. Ind.* iii, 766.—Vern. *Jiaputa*, *putjia* (Hind.), *patji* (Oudh), *juti* (Kumaon bhābar), *putranjiva* (Sansc.).

A moderate-sized evergreen tree, almost glabrous except the young shoots; bark-grey, whitish when young. *Branches* drooping. *Leaves* alternate, coriaceous, dark-green, shining, 2½-4 in. long, obliquely elliptic-oblong or ovate, obtuse, acute or shortly acuminate, entire or distantly serrulate; main lateral nerves many, with reticulate venation between; petioles ¼ in. long, pubescent; stipules small, triangular, acute, deciduous. *Flowers* small, yellow, diœcious. MALES very shortly pedicelled, arranged in dense axillary often spike-like clusters. *Sepals* 3-5, oblong, obtuse, ciliolate. *Stamens* usually 3, filaments more or less connate at the base, anthers globose. FEM.-flowers 2-3; pedicels ¼-½ in. long, pubescent. *Sepals* 5-6, broadly elliptic, obtuse, concave, ciliolate. *Ovary* 3-celled, tomentose;

styles 3, short, recurved, stigmas crescent-shaped. *Drupe*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovoid-globose, rounded or pointed at the apex, white-tomentose. *Putamen* pointed, very hard, deeply wrinkled, 1-seeded.

Moist shady forests in the Dehra Dun and Saharanpur forest divisions and eastwards along the Sub-Himalayan tracts. Flowers April and May, and the fruit ripens during the cold season. **DISTRIB.:** Throughout Tropical India, also in Ceylon and Burma. The whitish strong and durable wood is used by turners. Rosaries are made of the hard stones of the fruit to place round the necks of Hindu children to keep them in good health. The leaves are lopped for fodder and the seeds yield an oil which is used for burning.

**10. CYCLOSTEMON.** Blume; Fl. Brit. Ind. v, 339.

Trees. *Leaves* alternate, coriaceous, entire or crenulate, base often unequal. *Flowers* dioecious, in axillary clusters. *Petals* none. **MALE-flowers:** *Sepals* 4-6. *Stamens* many or few, inserted round a globose or depressed disk; filaments short, free; anthers erect, the cells parallel. *Pistillode* none or minute. **FEM.-flowers:** *Calyx* as in male. *Disk* annular or none. *Ovary* 2-4-celled, style elongate or none; stigmas dilated, fleshy or connate in a peltate disk, ovules 2 in each cell. *Fruit* subglobose or ovoid, indehiscent; pericarp hard, 2-celled. *Seeds* solitary in each cell, albumen fleshy, cotyledons broad and flat.—Species about 18, in Trop. India, Malaya and Africa.

*C. assamicus*, Hk. f. in F. B. I. v, 342; *Kanjilal For.* Fl. (ed. 2), 350; *Gamble Man.* 607; *Prair Bengal Pl.* 937; *Erandia Ind. Trees* 567.

A small evergreen tree with very thin greenish-grey bark. *Leaves* 3-5 in. long, ovate or elliptic-oblong, obtuse or subacute at the apex, dark-green, glabrous, shining; base rounded or acute, usually oblique; margins undulate; main lateral nerves 8-10 pairs, slender; petioles up to  $\frac{1}{2}$  in. long; stipules none. *Flowers* globose, green. **MALE-flowers** in clusters. *Stamens* about 12. **FEM.-flowers** solitary. *Ovary* 2-celled, densely silky; stigmas 2, subsessile, fleshy. *Fruit* shortly pedicelled,  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, ovoid or elliptic-oblong, rusty-tomentose. *Seeds* solitary in each cell; testa coriaceous, red.

Forests of Dehra Dun 'n swamps (Kanjilal) and eastwards along the Sub-Himalayan tract. Flowers Nov.-Dec. **DISTRIB.:** Kumaon up to

2,500 ft. and eastwards to the Darjeeling Terai, Assam, Khasia Hills, and from Chota Nagpur to Eastern Bengal and the Circars. The wood is hard and tough and with an even grain.

**11. ANTIDESMA**, Linn. ; Fl. Brit. Ind. v, 354.

Trees or shrubs. Leaves alternate, entire, stipules narrow, Flowers dioecious, apetalous, small or minute, in slender axillary or in terminal simple or branched spikes or racemes. MALE-flowers : *Calyx* 3-5, rarely 6-8-lobed or partite. *Disk* entire or lobed. *Stamens* 2-5, rarely more, inserted on or around the disk, often irregularly ; filaments inflexed in bud, anthers lunate or didymous ; cells globose, approximate or distant, connective thickened. *Pistillode* minute or obsolete. FEM.-flowers : *Calyx* as in male. *Disk* usually annular or cushion-like. *Ovary* usually 1-celled ; stigmas 2-4, usually short, 2-fid. or 2-partite ; ovules 2, pendulous. *Fruit* a small more or less compressed drupe, crowned by the sublateral or terminal stigmas. *Seed* small, albumen fleshy ; cotyledons broad, flat.—Species about 70, in the tropical regions of the Old World.

Leaves very obtuse ; flowers sessile ; stamens

4-7 ; ovary hairy . . . . . 1. *A. Ghæsembilla*.

Leaves acute or acuminate ; flowers pedicelled ;

stamens usually 2 ; ovary glabrous . . . . . 2. *A. diandrum*.

**1. A. Ghæsembilla**, Gærtn. *Fruct. i*, 189, t. 39 ; Brandis *For. Fl.* 446 ; *Ind. Trees* 564 ; *F. B. I. v*, 357 ; *Watt E. D.* ; *Gamble Man.* 610 ; *Prair. Beng. Pl.* 938 ; *Cooke Fl. Bomb. ii*, 592. *A. paniculatum*, Roxb. *Fl. Ind. iii*, 770. *A. pubescens*, Roxb. *l. c.*

A small deciduous tree with greyish bark ; branchlets pubescent or fulvous-tomentose. *Leaves* 2-4 in. long, oval obovate or orbicular-oblong, rounded or emarginate at the apex, glabrous or nearly so on the upper surface, pubescent or tomentose beneath ; base rounded or subcordate ; main lateral nerves 5-6 pairs ; petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. long ; stipules about as long as the petioles, lanceolate, acute, downy. *Flowers* greenish-yellow, sessile, arranged in slender panicle spikes. MALE-flowers : *Calyx* 5-7-partite, densely fulvous-hairy. *Stamens* 4-7 ; anthers crescent-shaped. *Disk* 5-part., pubescent. FEM.-flowers : *Calyx* as in the male. *Disk* annular. *Ovary* densely



hairy; stigmas minute, recurved. *Drupe* subglobose when fresh,  $\frac{1}{2}$  in. in diam.; reddish or black when ripe.

Common in the Sub-Himalayan forests of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June. **DISTRIB.**: Outer Himalayan ranges at low elevations, from the Sutlej to Bhutan; also in Assam Bengal, and from C. W. and S. India to Ceylon; extending to Burma, the Andamans, the Malay Pen. and Islands, China and Australia. The acid fruit is eaten, as well as the leaves. The Simla locality mentioned in Fl. Brit. Ind. refers to *Glochidion velutinum*.

**2. A. diandrum**, Roth Nov. Pl. Sp. 369; Brandis For. Fl. 447; Ind. Trees 565; F. B. I. v, 361; Watt E. D.; Kanjilal For. Fl. (ed. 2), 352; Gamble Man. 610; Prain Beng. Pl. 938; Cooke Fl. Bomb. ii, 593. *Stilago diandra*, Roxb. Fl. Ind. iii, 759.—Vern. *Kāli-khatai* (Dehra Dun), *dhakki* (Oudh), *amli* (Hind.).

A small deciduous tree or bush, the young parts usually glabrous; outer bark smooth, grey. *Leaves* bright-green, turning red before falling, thin, shortly petioled, varying in size from 1 to 5 in. in length, lanceolate or ovate-lanceolate, acute or acuminate, glabrous above, rarely pubescent beneath; stipules linear, acute, about twice as long as the petioles. *Flowers* minute, all pedicelled, in long slender glabrous or pubescent racemes; bracts ovate, shorter than the pedicels. **MALE flowers**: *Calyx*  $\frac{1}{10}$  in. long; lobes 4, short, obtuse. *Stamens* 2, rarely 3, at the base of the glabrous lobed disk. **FEM. flowers**: *Pedicels* stouter than in the male. *Calyx*  $\frac{1}{8}$  in. long; lobes deeper than in the male. *Ovary* glabrous. *Drupe*  $\frac{1}{2}$  in. in diam., purplish-red when ripe.

Common in the *sāl* forests of Dehra Dun and Saharanpur, and eastward along the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur. Flowers during May and June, and the fruit ripens in the cold season. **DISTRIB.**: Outer ranges of Himalaya from Garhwal and Kumaon eastwards; also in Bengal and in Central, W. and S. India, extending to Ceylon and Burma. The pinkish-grey wood is hard and close-grained. The leaves and small reddish fruits have a pleasantly acid taste, and are much eaten either raw or pickled.

## 12. CROTON, Linn., Fl. Brit. Ind. v, 385.

Trees or shrubs, rarely herbs. *Leaves* alternate, rarely opposite or whorled, usually with 2 glands at the base. *Flowers* usually



monœcious, solitary or clustered on the rachis of a terminal raceme; bracts small. MALE-flowers: *Calyx* 5 (rarely 4 or 6)-partite, segments imbricate or subvalvate. *Petals* 5, rarely 4 or 6, never larger and sometimes smaller than the calyx. *Disk* of 4 or 6 glands, opposite the sepals. *Stamens* many, inserted on the hairy receptacle; filaments free, inflexed in bud; anthers adnate, the cells parallel. *Pistillode* none. FEM.-flowers: *Sepals* rarely accrescent in fruit. *Petals* smaller than the sepals. *Disk* as in the males. *Ovary* 3 (rarely 2 or 4)-celled; ovules solitary in each cell; style usually slender, 2-4-cleft. *Capsule* subequally 6-valved or of 3 separating 2-valved cocci. *Seeds* smooth, caruncle small, testa crustaceous, albumen copious, cotyledons broad.—Species upwards of 500, in all hot countries.

*C. oblongifolius*, Roxb. Hort. Beng. 69; Fl. Ind. iii, 685; Brandis For. Fl. 440; Ind. Trees 577; F. B. I. v, 386; Watt E. D.; Gamble Man. 614; Prain Beng. Pl. 943; Cooke Fl. Bomb. ii, 599.—Vern. *Arjunna* (Oudh).

A medium-sized deciduous tree; young parts inflorescence and ovary clothed with minute orbicular silvery scales. *Leaves* crowded towards the ends of the branchlets, 5-10 in. long, oblong-lanceolate, subacute, glabrous (when mature), crenate or serrate, penninerved; base usually acute, without apparent glands above the petioles; petioles  $\frac{3}{8}$ -1 $\frac{1}{2}$  in. long. *Flowers* yellowish-green, solitary or clustered in the axils of minute bracts on long erect often fascicled racemes. MALE-flowers many, on the upper portion of the raceme. *Calyx* divided about  $\frac{2}{3}$  towards the base; segments  $\frac{1}{10}$  in. long or more, ovate, obtuse. *Petals*  $\frac{1}{2}$  in. long, elliptic-lanceolate, obtuse, woolly. *Stamens* 12, inflexed in bud; filaments hairy below. FEM.-flowers at the base of the racemes; pedicels short, stout. *Sepals* acute, the margins ciliate. *Petals*  $\frac{1}{2}$  in. long, obovate, the margins densely woolly. *Styles* 3, nearly  $\frac{1}{2}$  in. long, each divided into 2 slender curled branches  $\frac{1}{2}$  in. long. *Capsules*  $\frac{1}{2}$  in. in diam., subglobose, slightly 3-lobed, clothed with minute orbicular scales. *Seeds* ellipsoid, rounded on the back.

Common and often gregarious in the Gonda district of N. Oudh and in the Gorakhpur district (Brandis). The leaves turn red before falling in March, and the new foliage appears soon afterwards. DISTRIBUTION: Bengal, Ch. Nagpur, Silhet, Central, W. and S. India and in the dry region of Ceylon; also in the mixed forests of Burma. The bark, leaves and fruit are used in native medicine.

*C. TIGLIUM*, Linn.; *Roxb. Fl. Ind.* iii, 682; *Brandis For. Fl.* 440; *F. B. I. v.* 393; *Watt E. D.*; *Gamble Man.* 614; *Prain Beng. Pl.* 943; *Cooke Fl. Bomb.* ii, 600.—Vern *Jaipāl* (The Purging Croton).

A small evergreen tree, with the young shoots stellately hairy. *Leaves* glabrous and membranous, 2-4 in. long, ovate, acuminate serrate, 3-5-nerved. *Stamens* 15-20. *Capsule*  $\frac{3}{4}$ -1 in. long, ovoid, 3-locular. The plant is not truly indigenous in India, but it is frequently found as if wild, and in some parts of India is becoming naturalized. It is often cultivated in native gardens for the sake of the powerfully purgative oil yielded by the seeds. The so-called garden "Crotons," with variegated leaves, and which are much cultivated in Indian gardens, belong to the genus *Codiaeum*.

### 13. CHROZOPHORA, Neck.; *Fl. Brit. Ind.* v, 408.

Diffuse densely hispid or stellately tomentose herbs or undershrubs. *Leaves* alternate, sinuate-toothed or lobed, wavy or plaited, 2-glandular at the base. *Flowers* monœcious, in sessile axillary bracteate racemes; males crowded in the upper part of the raceme; females solitary and pedicelled. *MALE fl.* *Calyx* globose or ovoid, splitting into 5 valvate segments. *Petals* 5, short. *Disk* obscure. *Stamens* 5-15, filaments connate below in 1-3 series, anthers oblong; cells parallel, contiguous. *Pistillode* none. *FEM. fl.* *Sepals* 5, very narrow, sometimes setaceous or obsolete. *Disk* of 5 short broad glands alternate with the petals. *Ovary* 3-celled; styles 2-fid., erect or spreading, ovules solitary in each cell. *Fruit* a capsule of 3 hispid tomentose or scaly almost fleshy 2-valved cocci. *Seeds* without a strophiole, testa shining, albumen fleshy; cotyledons broad, flat.—Species about 7, Asiatic, Mediterranean and African.

Ovary and capsule clothed with stellate tomentum and silvery scales; stamens 5 . . .

1. *C. obliqua*, VAR.  
*hierosolymitana*.

Ovary and capsule clothed with stellate tomentum, but without silvery scales; stamens 15, in 2 series:—

An erect stellately hairy herb sparingly branched below; leaves up to 4 in. long, pale-green; sepals of female flowers triangular . . . . .

3. *C. Roßleri*.

Prostrate woolly herbs diffusely branching from the root; leaves up to  $1\frac{1}{2}$  in. in diam., often dark purplish-brown; sepals of female flowers linear:—

Leaves about as broad as long, eglandular at the base . . . . .

3. *C. prostrata*.

Leaves longer than broad, 2-glandular at the base . . . . .

*C. prostrata*, VAR.  
*parvifolia*.

1. *C. obliqua*, A. Juss. Tent. Euphorb. 28, VAR. *hierosolymitana*, Spreng. Syst. 850. *C. verbascifolia*, A. Juss. Croton tinctorius, Wall. Cat 7716 G. Leaves ovate, nearly as long as broad, usually more or less toothed, clothed on both sides with stellate tomentum. Stamens 5. Ovary and capsule clothed with stellate hairs and silvery scales. Seeds glabrous.

The only locality recorded for this plant as occurring within the area of this flora is Muttra, where specimens are said to have gathered many years ago by Colonel Hardwicke, but by no other collector east of the Jumna subsequently. The plant appears to be widely distributed in the Punjab Plain from Ambala to Rawal Pindi and on the Salt Range; it extends also to Arabia, Palestine (Garden of Gethsemane near Jerusalem, collected by Sieber) and North Africa.

2. *C. Rottleri*, A. Juss. Tent. Euphorb. 28. *C. plicata*, Dalz. and Gibs. (not of A. Juss.); Royle Ill. 329; F. B. I. v, 409; Watt E. D.; Prain Beng. i. l. 944; Cooke Fl. Bomb. ii, 607. Croton plicatus, Vahl; Roxb. Fl. Ind. iii, 681.

An erect hoary annual herb up to 2 ft. high, with a long straight slender tap-root. Stem usually naked below, sparingly branched above. Leaves 2-4 in. long, ovate to orbicular, often obscurely 3-lobed, thick, rugose, pale-green, stellate-hairy on both surfaces; petioles 1-2 in. long. Male flowers. Calyx  $\frac{1}{2}$  in. long. Petals smaller, very thin, ovate-lanceolate. Stamens 15, in two whorls. Fem. flowers. Sepals  $\frac{1}{2}$  in. long, triangular. Petals shorter and narrower. Capsules  $\frac{1}{2}$  in. in diam., densely stellate-hairy, but without silvery scales.

Mirzapur at Sháhganj (J.D.H.). DISTRIB.: Punjab Plain (T. Thomson); Sind (Stocks); Gujarát (D. and G.); Dharwar (Cooke). Deccan (D. and G., Graham, Cooke); Behar (J. D. H.) Bengal (Prain); Chota Nagpur (Haines); Burma (Griff); also in Madras Pres., extending to N. Africa and Spain. The root and leaves are stated by Stewart to be used medicinally in the Punjab.

3. *C. prostrata*, Dalz. in Dalz. and Gibs. Bomb. Fl. 233; Cooke Fl. Bomb. ii, 607. *C. plicata*, forma prostrata, Hook f. in F. B. I. v, 410.

A procumbent humifuse stellately woolly herb; branches many, spreading from the root, woolly-tomentose. *Leaves*  $\frac{1}{2}$ -1 in. long and about as broad, deeply bullate, often dark purplish-brown, finely pubescent above, densely stellate-woolly beneath, base eglandular. *Flowers* in short few-flowered axillary racemes; bracts linear,  $\frac{1}{2}$ - $\frac{1}{4}$  in. long. Male flowers. *Calyx*  $\frac{1}{2}$  in. long. *Petals* smaller, elliptic-lanceolate. *Stamens* 15, in two whorls. *Fem. flowers.* *Sepals* linear, acute. *Petals* linear, smaller and narrower than the sepals. *Capsule*  $\frac{1}{4}$  in. in diam., stellately woolly, without silvery scales.

Gorakhpur district (Duthie); Naorangah (Jacquemont). **DISTRIB.:** Bengal, in Behar, Patna (Buch.-Hamilton)-Wall. Cat. 7716 C. partly; Punjab Plain, Lahore (T. Thomson), Multan (Edgeworth 8023), Jabalpur (Vieary); C. India, Guna (King); C. Prov., Nimar district near Hewra (Duthie); without locality (R. Thompson); also in the Bombay and Madras Presidencies, and extending to N. Africa.

**VAR. parvifolia.** *C. parvifolia*, Klotzsch ex Schweini. *Pl. Nilot.* 10. Leaves longer than broad, 2-glandular at the base. Bundelkhand, in black soil (Edgeworth 8029); N. Oudh in the Kheri district (Duthie); Lucknow (T. Anderson); Mirzapur (Griffith), Farakhabad and Fatehpur (Griffith 4794). **DISTRIB.:** Punjab Plain: (Edgeworth 126), (T. Thomson 1508), (Drummond 3061, 6348), Sind (Stocks 547); extending south to Bombay and Madras Presidencies, also in N. Africa.

#### 14. *BALIOSPERMUM*, Blume; Fl. Brit. Ind. v, 461.

Erect shrubs. *Leaves* alternate, sinuate-toothed or lobed, penninerved or 3-5-nerved at the 2-glandular base. *Flowers* small, monœcious or dioecious, apetalous, arranged in panicles or racemes. **MALE fl.** globose. *Sepals* 4-6, membranous, orbicular, concave, imbricate. *Disk* of 4-6 glands. *Stamens* 10-30; filaments slender, free; anthers terminal, the cells adnate throughout to the broad connective, dehiscent introrsely, the slits at length becoming lateral. *Pistillode* none. **FEM. fl.** *Sepals* 5-6, lanceolate, entire or toothed, sometimes accrescent in fruit. *Disk* entire. *Ovary* 3-celled; styles rather long, stout, 2-fid. or-partite, stigmas smooth, ovules solitary in each cell. *Fruit* a capsule of three 2-valved crustaceous

cocci. *Seeds* ovoid, testa crustaceous, albumen fleshy, cotyledons flat and broad.—Species 6, in India and Malaya.

**B. axillare**, Blume Bijdr. 604; F. B. I. v, 461; Kanjilâl For. Fl. (ed. 2), 357; Gamble Man. 624; Prain Beng. Pl. 946, Brandis Ind. Trees 583, Cooke Fl. Bomb. ii, 608. *B. indicum*, Dcne. in Jacqm. Voy. Bot. 154, t. 155. *B. montanum*, Muell. Arg., Watt E. D.; Croton polyandrum, Roxb. Fl. Ind. iii, 682; Royle Ill. 327, 328.

A stout leafy undershrub 3-6 ft. high with herbaceous branches from the root, glabrous except the young shoots and sometimes the leaves beneath. Leaves firmly coriaceous, very variable in size and shape; the upper 2-3 in. long, lanceolate, penninerved; the lower 6-12 in. long, often palmately 3-5-lobed and with sinuate-toothed margins; base rounded or cuneate; petioles 2-6 in. long; stipules of 2 glands. *Flowers* usually monœcious, arranged in many axillary racemes or contracted panicles, all male or with a few females at the base. **MALE** flowers: *Calyx* globose,  $\frac{1}{10}$  in., 4-5-partite, often slightly hairy; segments finely mottled. *Disk* of 6 glands. *Stamens* about 20. **FEM.** flowers. *Sepals* not enlarging in fruit. *Disk* thin,  $\frac{1}{10}$  in. in diam. *Ovary hairy*; styles about  $\frac{1}{8}$  in. long, thick, 2-partite, dull-red. *Capsules*  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, obovoid, usually hairy. *Seeds*  $\frac{1}{2}$  in. long, smooth, mottled.

Dehra Dun, in shady places, and eastwards along the Sub-Himalayan forest tracts, where it often forms a considerable portion of the undergrowth. It flowers and produces fruit almost throughout the year. **DISTRIB.**: Outer ranges of Himalaya from Kashmir to Bhutan up to 3,000 ft.; also Assam, Khasia Hills, Bengal, Chittagong, Burma and Siam, and from C. & W. India to Travancore; extending to Java and the Malay Peninsula. The seed, which resembles that of the Castor-oil plant, but smaller, is used as a drastic purgative, and the root and leaves are much employed in Hindu medicine.

15. **ACALYPHA**, Linn.; Fl. Brit. Ind. v, 414.

Herbs, shrubs or trees. *Leaves* alternate, toothed or crenate, rarely entire, penniveined or 3-5-nerved. *Flowers* small, monœcious or occasionally diœcious, apetalous and without a disk, arranged in axillary or terminal racemes; males minute, without bracts; females 1-2, within a peduncled solitary bract, or sometimes at the base of large accrescent leafy bracts, low on the male spikes

or on separate spikes. MALE flowers: *Sepals* 4, valvate, more or less connate in a membranous calyx. *Stamens* usually 8, or many on a convex receptacle; filaments short, free; anther-cells distinct, divaricate, often becoming twisted or flexuous. *Pistillode* none. FEM. flowers: *Sepals* 3-4, minute, imbricate. *Ovary* 3-celled; styles filiform, often long and laciniate or fimbriate; ovules solitary in each cell. *Fruit* a capsule of 3 minute 2-valved crustaceous cocci. *Seeds* subglobose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 225, in trop. and sub-trop. regions of the world.

Bracts distant, shortly dentate; capsule hispid 1. *A. indica*.

Bracts crowded, fimbriate; capsule glabrous. 2. *A. ciliata*.

1. *A. indica*, Linn. *Sp. Pl.* 1003; Roxb. *Fl. Ind.* iii, 675; Royle *Ill.* 327; F. B. I. v, 416; Watt *E. D.*; Prain *Beng. Pl.* 948; Cooke *Fl. Bomb.* ii, 610.

An erect annual herb, 1-2½ ft. high. *Branches* many, angular, finely pubescent. *Leaves* thin, glabrous, 1-3 in. long, ovate or rhomboid-ovate, obtuse or subacute, crenate-serrate; base cuneate, 3-nerved; petioles slender, usually longer than the blade; stipules minute. *Flowers* in lax erect axillary elongate spikes; the males minute, clustered towards the summit of the spike, ebracteate; the females in clusters of 3-5, subtended by a shortly stalked leaf-like truncate dentate many-nerved bract ¼-½ in. in diam. *Capsules* hispid, concealed by the bracts, often only 1-seeded. *Seed* ⅓ in. long, ovoid, smooth, pale-brown.

Very common within the area, especially as a garden weed, flowering during the greater part of the year. *DISTRIB.*: Throughout the hotter parts of India and in Ceylon, extending to Java and Trop. Africa.

2. *A. ciliata*, Forsk. *Fl. Egypt.-Arab.* 162; Roxb. *Fl. Ind.* iii, 676; F. B. I. v, 417; Watt *E. D.*; Collett *Fl. Siml.* 452; Prain *Beng. Pl.* 948; Cooke *Fl. Bomb.* ii, 611.

A stout herb, 1-2½ ft. high. *Stems* erect; branches few, pubescent when young. *Leaves* thin, 1½-3 in. long, ovate, acuminate or caudate-acuminate, finely serrate, pubescent on the veins beneath; base usually rounded, 5-nerved; petioles spreading, slender, usually exceeding the leaf-blade. *Flowers* in axillary androgynous spikes ½-¾ in. long; the males few, very minute and sessile at the top of the spike; the females many and crowded at its base; bracts large,



pale-green, 1-2-flowered, exceeding the capsules, strongly nerved, the many nerves ending in long subulate hispid teeth. *Capsules* glabrous; cocci very thin, white. *Seeds* globose-ovoid, smooth,  $\frac{1}{16}$  in. long.

Dehra Dun (Duthie), Bundelkhand (Edgeworth) and probably in many other localities within the area. *DISTRIB.*: W. Himalaya from Kashmir to Kumaon up to 6,000 ft., and southwards from Bengal and Bombay to S. India and Ceylon, extending to Arabia and Trop-Africa.

**16. TREWIA**, Linn.; *Fl. Brit. Ind.* v, 423.

Soft-wooded trees. *Leaves* opposite, broadly ovate or orbicular; entire; base cordate, 3-5-nerved. *Flowers* rather large, diœcious, appearing before the leaves, apetalous and without a disk; males in lax lateral racemes, one to each bract; females solitary on long peduncles or racemose. *MALE fl.*: *Calyx* globose, splitting into 3-4 broad concave often reflexed segments. *Stamens* many, on a convex receptacle, filaments free, anthers dorsifixed, oblong, the cells parallel and contiguous. *Pistillode* none. *FEM. fl.*: *Sepals* 3-5, broad, imbricate, caducous. *Ovary* 2-4-celled; styles connate below, long, terete, entire, papillose throughout, ovules solitary in each cell. *Fruit* 2-4-celled, indehiscent or opening loculicidally, endocarp crustaceous. *Seeds* ovoid, testa hard, albumen fleshy, cotyledons broad and flat.—Species 2, one in India extending to Ceylon, the other apparently endemic in W. and S. India.

*T. nudiflora*, Linn. *Sp. Pl.* 1193 (*Trevia*); Roxb. *Fl. Ind.* iii, 837; Brandis *For. Fl.* 443; *Ind. Trees* 590; *F. B. I.* v, 423; Watt *E. D.*; Kanjilál *For. Fl.* (ed. 2.), 353; Gamble *Man.* 617; Prain *Beng. Pl.* 948; Cooke *Fl. Bomb.* ii, 614.

A medium-sized deciduous tree with a smooth grey bark. Young shoots and the leaves beneath and the inflorescence clothed with cottony wool or sometimes nearly glabrous. *Leaves* 3-7 in. long, ovate, acuminate, glabrous and bright-green above; base rounded or cordate, 3-5-nerved; petioles 1-3 in. long; stipules minute, acute, caducous. *MALE flowers*  $\frac{1}{2}$ - $\frac{1}{4}$  in. in diam., pale-green, arranged in pendulous racemes 3-8 in. long; pedicels short, slender, horizontal. *Sepals* valvate, concave. *Stamens* many. *FEM. flowers* solitary or 2-3 together, on long peduncles. *Sepals* 3-5, imbricate, caducous.



*Ovary* woolly; styles  $\frac{1}{2}$ - $\frac{3}{4}$  in. long, yellow. *Fruit* almost woody, globose, 1-1 $\frac{1}{2}$  in. in diam. *Seeds* smooth and polished, dark-brown.

Ravines and damp places in the forests of Dehra Dun and Saharanpur, extending eastwards along the Sub-Himalayan forest tracts of Rohilkhand, N. Oudh and Gorakhpur. The tree is leafless from Jan. to March, the new leaves appear during March and April, and the flowers between Feb. and April, and the fruit ripens during the cold season. **DISTRIB.:** Kumaon, Assam and the Khasia Hills, and southwards throughout the hotter parts of India and in Ceylon, extending to Burma and to the Malay Pen, and Islands. Brandis states that this tree, reproduces abundantly from root-suckers. The soft white wood is used for making drums.

17. **MALLOTUS**, Lour.; Fl. Brit. Ind. v, 427.

Trees or shrubs. *Leaves* opposite or alternate, entire toothed or 3-lobed, penniveined or 3-7-nerved, sometimes peltate, often gland-dotted beneath and sometimes with glandular areas at the base on the lower surface. *Flowers* small, dioecious or monœcious, apetalous, arranged in axillary or terminal simple or branched spikes or racemes; males fascicled, females solitary in the bracts. **MALE flowers:** *Calyx* globose or ovoid, 3-5-partite, lobes valvate. *Disk* none. *Stamens* many, crowded on the flat or convex receptacle, filaments free, anthers small, dorsifixed; the cells globose or shortly oblong, parallel, adnate to the wide connective, often distinct. *Pistillode* none or very minute. **FEM. flowers:** *Calyx* spathaceous or 3-6-lobed or-partite. *Disk* none or small; styles free or connate below, spreading or recurved above, entire plumose or papillose, ovules solitary in each cell. *Fruit* a capsule of 2-3 (rarely 4) 2-valved tubercled echinate paleaceous or smooth cocci. *Seeds* ovoid oblong or globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 70-80, in tropical regions of the Old World.

**M. philippinensis**, Muell. Arg. in *Linnaea* xxiv, 196; Brand. *For. Fl.* 444; *Ind. Trees* 590; *F. B. I.* v, 442; *Watt E. D.*; *Comm. Prod. Ind.* 755; *Kanjilal For. Fl.* (ed. 2) 353; *Gamble Man.* 619; *Collett Fl. Siml.* 453; *Prair Beng. Pl.* 950; *Cooke Fl. Bomb.* ii, 615. *Rottlera tinctoria*, Roxb.; *Fl. Ind.* iii, 827; *Royle Ill.* 329.—*Vern Kamela, raini* (Dehra Dun), *reoni* (Bundelkhand), *rohni* (Oudh), *senduria* (Merwara).

A small much-branched evergreen tree with a thin dark-grey bark ; young parts and inflorescence tawny or rusty-pubescent. *Leaves* alternate, variable in size and shape, 3-6 in. long, ovate ovate-oblong or lanceolate, acuminate, entire or sometimes toothed, glabrous above, sub-glaucously pubescent and with many close-set orbicular reddish glands beneath, reticulately veined, base rounded or acute, strongly 3-nerved and with 4-7 pairs of lateral nerves above the basal ones ; petiole about half the length of the blade, fulvous-pubescent and with two small sessile glands one on each side of the summit. *Flowers* small, diœcious. MALE flowers sessile or nearly so, in erect terminal spikes longer than the leaves. *Sepals* usually 4, lanceolate, acute. FEM. flowers sessile in short spikes. *Sepals* 3 or 4. *Capsules*  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam., 3-lobed and 3-valved, covered with a bright red powder composed of fine grains of a resinous substance mixed with minute stellate hairs. *Seeds* about  $\frac{1}{8}$  in. in diam., subglobose, black.

Very common within the area, and often associated with sál. Flowers during the cold season and the fruit ripens from March to May. **DISTRIB. :** Outer Himalayan ranges from the Indus eastwards, up to 4,500 ft. ; and throughout tropical India ; extending to Ceylon, Burma, the Andaman and Malay Islands, China and Australia. The red resinous grains with which the ripe capsules are covered is the well known *kamela* powder. It is much valued as a dye, especially for silk, and is also extensively used as a vermifuge. The bark is sometimes employed in tanning, and the wood affords good fuel.

**18. HOMONOIA**, Lour. ; Fl. Brit. Ind. v, 455.

Rigid shrubs. *Leaves* alternate, long, narrow and subentire or short and toothed, glandular-lepidote. *Flowers* usually diœcious, apetalous and without any disk, arranged in many-or few-flowered axillary spikes, or from the old wood. MALE flowers: *Calyx* globose, splitting into 3 valvate segments. *Stamens* many, in a dense globose cluster of branched filaments ; anther-cells sub-globose, divaricate, connective obscure. *Pistillode* none. FEM. flowers: *Sepals* 5-8, narrow, unequal, imbricate, caducous. *Ovary* 3-celled, styles entire, spreading, papillose, ovules solitary in each cell. *Fruit* a small capsule of 3 smooth 2-valved cocci, *Seeds* rounded on the back, slightly angular on the inner face ; testa crustaceous, hard with a thin fleshy coat, albumen fleshy, cotyledons broad and flat.—Species 3 or 4, Indian or Malayan.

**H. riparia**, Lour. *Fl. Cochinch.* 637; *Franch. For. Fl.* 445; *Ind. Trees* 593; *F. B. I. v.* 455; *Watt E. D.: Gamble Man.* 622; *Prair. Beng. Pl.* 951; *Cooke Fl. Bomb.* ii, 620; *Adelia neriifolia*, Roth; *Roxb. Fl. Ind.* iii, 849.

A small evergreen willow-like shrub with brown bark; branchlets young leaves and inflorescence pubescent. *Leaves* erect, closely set, 3-6 in. long, linear-oblong or linear-lanceolate, acute, apiculate, entire or serrulate towards the tip, glabrous above, densely clothed beneath with reddish-brown orbicular gland-like scales; base acute or rounded; main lateral nerves 10-30 pairs, the veins between them reticulate; petioles  $\frac{1}{4}$ - $\frac{3}{8}$  in. long; stipules  $\frac{1}{2}$  in. long, linear-lanceolate, acute. *Flowers* dioecious, sessile, in axillary bracteate spikes 2-5 in. long; rachis pubescent; bracts ovate-acuminate, pubescent. **MALE** flowers: *Sepals* 3, broadly elliptic, concave, glabrous,  $\frac{1}{2}$  in. long. *Anthers* red. **FEM.** flowers. *Sepals* usually 5, narrowly ovate, acuminate,  $\frac{1}{2}$  in. long, pubescent. *Ovary* pubescent; styles 3, shortly connate at the base. *Capsule* globose,  $\frac{1}{2}$  in. in diam., tomentose. *Seeds*  $\frac{1}{16}$  in. long, smooth, yellowish-brown.

Bundelkhand, in rocky river-beds (Edgeworth, Duthie, etc.). **DISTRIB.:** Bengal, Sikkim, Chittagong, Assam, Khasia Hills, Burma and southwards to Central and W. India to Ceylon; extending to the Andaman Islands, Cochinchina and Java.

### 19. **RICINUS**, Linn.; *Fl. Brit. Ind.* v, 457.

A tall glabrous and glaucous annual, sometimes shrubby or tree-like. *Leaves* alternate, broad, palmately lobed; lobes 7 or more, serrate. *Flowers* monoecious, rather large, in terminal sub-paniculate racemes. *Perianth* simple and without any disk, the male flowers crowded in the upper portion of the inflorescence, the females below. **MALE** flowers: *Calyx* membranous, splitting valvately into 3-5 segments. *Stamens* very many; filaments connate and repeatedly branched; anthers with distinct distant sub-globose divergent cells. *Pistillode* none. **FEM.** flowers: *Calyx* spathaceous, caducous. *Ovary* 3-celled; styles entire, 2-fid. or 2-partite; ovules solitary in each cell. *Fruit* a prickly capsule of three 2-valved cocci. *Seeds* oblong, testa crustaceous, albumen fleshy; cotyledons broad, flat.—A single species, probably of African origin, now widely cultivated in tropical countries.

*R. communis*, Linn., Roxb. *Fl. Ind.* iii, 689; Royle *Ill.* 323; Brandis *For. Fl.* 445; Ind. *Trees* 593; DC. *L'Orig. Pl. Cult.* 339; Duthie and Fuller *F. and G. Crops* ii, 38, t. 43; F. B. I. v, 457; Watt *E. D.; Comm. Prod. Ind.*, 915; Gamble *Man.* 622; *Prair. Beng. Pl.* 352; Cooke *Fl. Bomb.* ii, 627.—Vern. *Arand.* etc.—The Castor-oil plant, or Palma Christi.

The Castor-oil plant is much cultivated within the area of this flora and throughout the hotter parts of India. It frequently runs wild, and in many places has become naturalized. The tall perennial bushy kind is often grown in hedges, or in fields as a shelter for other crops. In order to obtain oil of the best quality the plant is usually grown as an annual, and often as a pure crop. The oil is largely used for burning and as a lubricant, and (when cold-drawn) for medicinal purposes. The plant is much cultivated in gardens for the sake of the brightly coloured foliage of some of its varieties. For full particulars regarding its cultivation in India, and the extraction and the various uses of the oil see Watt's "Commercial Products of India."

**20. TRAGIA**, Linn.; *Fl. Brit. Ind.* v, 464.

Perennial usually twining or climbing herbs, hispid with stinging hairs. *Leaves* alternate, simple or palmately 3-lobed, serrate, 3-5-nerved at the base. *Flowers* monœcious, in terminal and leaf-opposed androgynous racemes, apetalous and without any disk; the males uppermost in the raceme, females below and few. **MALE** flowers: *Caly.* globose or obovoid, valvately 3-5-partite. *Stamens* 1-3, rarely many, filaments free or connate; anthers ovate or oblong, cells parallel and contiguous. *Pistillode* minute, 3-fid. or none. **FEM.** flowers: *Sepals* 6, imbricate, entire or pinnatifid, often enlarged, hardened and stellately spreading in fruit. *Ovary* 3-celled; styles united below in a stout column, free spreading and entire above; ovules solitary in each cell. *Fruit* a capsule of three 2-valved cocci, endocarp crustaceous. *Seeds* globose, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species about 50, chiefly tropical.

A twining herb; leaves simple; style circinnately revolute . . . . .

1. *T. involucreta*.

An erect or sometimes climbing herb; leaves palmately 3-partite; styles slightly spreading, not revolute . . . . .

2. *T. cannabin.*

1. *T. involucrata*, Linn. *Sp. Pl.* 980; *Roxb. Fl. Ind.* iii, 576; *Royle III.* 327; *F. B. I. v.* 465; *Watt E. D.*; *Prain Beng. Pl.* 952; *Cooke Fl. Bomb.* ii, 621.

A perennial more or less hispid herb, with scattered stinging hairs. *Stems* elongate, slender, twining. *Leaves* 1-4 in. long, variable, oblong-lanceolate to broadly ovate, acuminate, serrate, hairy; base rounded or cordate; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  long; stipules  $\frac{1}{2}$  in. long, ovate, acute, somewhat auricled at the base. *Flowers* yellowish, shortly stalked, usually in hairy racemes 1-2 in. long; bracts  $\frac{1}{10}$  in. long, lanceolate, acute. **MALE** flowers: *Sepals* 3, broadly elliptic or orbicular, concave, glabrous,  $\frac{1}{10}$  in. long. *Stamens* 3. *Pistillode* minute, 3-fid. **FEM.** flowers: *Sepals* 6, ovate, pinnatifid, very hispid,  $\frac{1}{2}$  in. long, elongating in fruit. *Ovary* 3-lobed, hispid; styles 3, united below in a stout column which is often as long as the circinnately revolute branches. *Capsules*  $\frac{3}{8}$  in. in diam., 3-lobed, white, hispid. *Seeds* globose, smooth.

Forests of N. Oudh (R. Thompson), Kheri district (Duthie) **DISTRIB.**: Throughout India from the Punjab and the outer Himalayan ranges eastwards to Assam, and south to Burma S. India and Ceylon; also in China. The plant is not eaten by cattle. The root, leaves and fruit are used medicinally.

2. *T. cannabina*, Linn. *f. Suppl.* 415; *Roxb. Fl. Ind.* iii, 575; *Cooke Fl. Bomb.* ii, 622. *T. involucrata*, var. *cannabina*, Muell.-Arg.; *F. B. I. v.* 465.

An erect or climbing shrub 4-5 ft. high, not twining, more or less hispid and with stinging hairs. *Stems* stout, terete, woody. *Leaves* palmately 3-partite, up to 3½ in. long; lobes toothed or pinnatifid, the mid-lobe much longer than the lateral ones. Male flowers and calyx of female flowers as in *T. involucrata*. *Styles* 3, slightly spreading, not revolute. *Capsules*  $\frac{3}{8}$  in. across, 3-lobed, hirsute; lobes globose. *Seeds* globose, smooth,  $\frac{1}{4}$  in. in diam.

Jumna ravines near Etawah (Duthie), Bundelkhand (Duthie), and probably in other localities within the area of this flora. **DISTRIB.**: Throughout the hotter parts of India and in Ceylon; often found in hedges.

21. *SAPIUM*, P. Br.; *Fl. Brit. Ind.* v, 469.

Trees and shrubs. *Leaves* alternate, entire, serrate or toothed, penninerved, petiole often 2-glandular at the top. *Flowers* monocious, in terminal simple or branched spikes or racemes, apetalous and without any disk; males above, several in each bract;

females in the lower part of the spikes or racemes, or in separate spikes, solitary in the bracts. MALE flowers: *Calyx* membranous, shortly 2-3-lobed or toothed, or splitting to the base into 2 or 3 valvate segments. *Stamens* 2 or 3, filaments free; anther-cells ovoid, distinct, contiguous, parallel. *Pistillode* none. FEM. flowers: *Calyx* 3-fid. or 3-partite. *Ovary* 2-3-celled, styles free or connate at the base, spreading and recurved, entire; ovules solitary in each cell. *Fruit* a crustaceous capsule, fleshy or pulpy, rarely woody, at length loculicidally 3-valved. *Seeds* globose, with a strophiole, usually long-persistent on the columella, testa crustaceous, albumen fleshy, cotyledons broad and flat.—Species 25, all tropical.

*S. insigne*, Trimen *Syst. Cat. Ceyl. Pl.* 83; *F. B. I. v.* 471; *Watt E. D.*; *Kanjilâl For. Fl.* (ed. 2) 356; *Collett Fl. Siml.* 453; *Gamble Man.* 625; *Prain Beng. Pl.* 954; *Cooke Fl. Bomb. ii.* 622; *Brandis Ind. Trees* 585. *Falconeria insignis*, *Royle Ill.* 354, t. 84 a or t. 98. *F. Wallichiana*, *Royle l.c.f.* 3. *Excæcaria insignis*, *Muell. Arg.*; *Brandis For. Fl.* 442.—Vern. *Khinna*, *khirun*, *khiria*, *khirmi*, *lendwa*.

A medium-sized glabrous deciduous tree or shrub, with a thick acrid milky juice; bark grey, rough and cork-like when old; branches thick and soft. *Leaves* bright-green, crowded towards the ends of the branches, 5-10 in. long, elliptic or oblong-lanceolate, acuminate, crenate-serrate; base acute, sometimes unequal; main lateral nerves 10-16 pairs, slender; petioles 1-1½ in. long, with 2 conspicuous glands at the apex. *Flowers* appearing before the leaves, yellowish green, in 1-sexual robust spikes 3-8 in. long. MALE FLOWERS sessile, ¼-½ in. in diam., the central flower of each fascicle opening first. *Sepals* 2, open in bud, orbicular, concave, ¼ in. in diam. *Stamens* 2, filaments very short, anthers scarlet. FEM. FLOWERS shortly stalked. *Sepals* ovate-acuminate. *Styles* 3, short spreading, slightly connate at the base. *Capsules* ½ in. in diam., subglobose, at first fleshy, becoming dry and irregularly dehiscent when ripe, closely packed on the robust rhachis.

Dehra Dun and Sub-Himalayan tract eastwards. Flowers Jan.—March. DISTRIB.: Outer warm valleys of the Himalaya on dry rocky slopes from the Beas eastwards to Bhutan (not in Sikkim) up to 5,500 ft.; also in Assam, Chittagong and Burma; extending to the Bombay Pres., S. India and Ceylon. The soft white wood is used for making the cylinders of native drums. The acrid milky juice, said to be



poisonous, is sometimes used externally in medicine. The tree is frequently killed by frost at the higher elevations.

*SAPIUM SEBIFERUM*, Roxb.; *Fl. Ind.* iii, 693; *F. B. I.* v, 470; *Watt. E. D.*; *Comm. Prod. Ind.* 979; *Kanjilâl For. Fl.* (ed. 2), 355; *Gamble Man.* 624; *Prair Beng. Pl.* 954; *Brandis Ind. Trees* 534; *Cooke Fl. Bomb.* ii, 623. *Excoecaria sebifera*, *Muhl.-Arg.*; *Brandis For. Fl.* 441. *Stillingia sebifera*, *Michx.*; *Royle Ill.* 328.—Vern. *Târ-charbi* (Dehra Dun), *pahâri shisham* (Saharanpur). (Chinese Tallow-tree). A small quick-growing deciduous tree, somewhat resembling in its foliage the shisham-tree (*Dalbergia Sissoo*). It is cultivated in many parts of the Upper Gangetic Plain, and has become quite naturalized, especially in Dehra Dun. It flowers June—Aug., and the seeds ripen Oct.—Dec. The tree is indigenous in China and Japan, where the white tallow-looking wax surrounding the seeds is used for burning. The leaves before falling become beautifully coloured with orange and scarlet.

The following plants belonging to genera not mentioned above should be briefly noticed :—

*PEDILANTHUS TITHYMALOIDES*, *Poit.*—A shrub with fleshy branches, allied to *Euphorbia*, from which it chiefly differs in its conspicuous scarlet slipper-shaped involucre. It was introduced into India from the West Indies, and is grown in hedges in many parts of the country. *Royle (Ill. 328)* mentions it as a possible substitute for ipecacuanha (*Psychotria Ipecacuanha*), which is a native of Brazil.

*JATROPHA CURCÁS*, *Linn.*; *Royle Ill.* 328; *Brandis For. Fl.* 442. *Ind. Trees* 576; *F. B. I.* v, 383; *Watt E. D.*; *Kanjilâl For. Fl.* (ed. 2), 352; *Gamble Man.* 613; *Prair Beng. Pl.* 941; *Cooke Fl. Bomb.* ii, 578.—Vern. *Safed arand.* (Physic-nut). A soft-wooded evergreen shrub or small tree introduced from Trop. America. It is often found in a semi-wild condition in the vicinity of villages or is planted in hedges. The oil extracted from the seeds is much used for burning, as well as medicinally. Other exotic species of *Jatropha*, including *J. gossypifolia*, *multifida* and *podagrica*, are more or less cultivated in Indian gardens for ornamental purposes.

*ALBURITES MOLUCCANA*, *Willd.*; *Royle Ill.* 327; *F. B. I.* v, 384; *Watt. E. D.*; *Gamble Man.* 613; *Prair Beng. Pl.* 942; *Cooke Fl. Bomb.* ii, 626. *A. triloba*, *Forst.*; *Roxb. Fl. Ind.* iii, 629. Belgaum Walnut.



A handsome tree with polymorphous leaves and white flowers. It is a native of the Malay Archipelago, whence it was introduced into India and is now largely grown in gardens. The edible seeds contain a large quantity of oil, which is used for cooking as well as medicinally.

MANIHOT UTILISSIMA, *Pohl.* is the Bitter Cassava plant, from the pounded roots of which manioc or cassava meal is prepared, also tapioca. It is a tall plant with tuberous roots and palmate leaves. It was introduced from S. America by the Portuguese and is occasionally cultivated in Indian gardens.

### C. URTICACEÆ.

Herbs shrubs or trees. *Leaves* usually alternate, often oblique; stipules various. *Flowers* cymose or in clusters, usually minute, monœcious or diœcious and sometimes 2-sexual or polygamous, often crowded on the surface of a fleshy flat concave or globose receptacle or (in *Ficus*) on the inner walls of a closed receptacle; bracts usually small or none, but sometimes 2—4 or more in an involucre; bracteoles small or none, but sometimes conspicuous. *Perianth* simple, calycine, regular or irregular, equally or unequally toothed lobed or partite, segments imbricate or valvate. *Disk* hypogynous, obscure or none. *Stamens* as many as and opposite the perianth-lobes, rarely fewer or more, filaments usually free at the base, anthers 2-celled. *Pistillode* in male flowers small or none. *Ovary* superior, 1-celled, style often eccentric, simple or 2-fid, with stigmatose arms, or stigmas sessile, plumose or penicillate, ovule solitary. *Fruit* simple, as a drupe or samara, or of small free achenes, or compound in a confluent mass of perianths and pericarps. *Seed* erect, lateral or pendulous, testa membranous; albumen copious scanty or none, embryo straight or curved.—Species 1,500 or more, chiefly in tropical and sub-tropical regions of the world.

Plants with watery juice :—

Anthers in bud erect; style 2-fid.; ovule pendulous :—

Flowers usually 2-sexual or polygamous—

Trees or shrubs with penninerved deciduous leaves :—

Fruit dry, samaroid . . . . . 1. HOLOPTELEA.

- Fruit a drupe.—Trees or shrubs :—  
 Leaves glabrous or softly pubescent ;  
 male-sepals imbricate ; cotyledons  
 broad . . . . . 2. CELTIS.
- Leaves scabrous ; male-sepals indu-  
 plicate-valvate ; cotyledons narrow . . . . . 3. TREMA
- Flowers usually dioecious.—Herbs with  
 digitate leaves . . . . . 4. CANNABIS.
- Anthers in bud inflexed ; style undivided  
 or none ; ovule erect :—  
 Leaves and stem with stinging hairs.—  
 Herbs with alternate leaves and connate  
 stipules . . . . . 5. GIRARDINIA.
- Leaves and stems without stinging hairs :—  
 Female perianth 3-5-partite or obsolete ;  
 stigma penicillate ; flowers in cymes  
 or clustered on a fleshy receptacle :—  
 Leaves opposite ; flowers minute, in  
 dense cymose heads . . . . . 6. PILEA.
- Leaves alternate ; flowers on a fleshy  
 receptacle ; female perianth minute  
 or obsolete . . . . . 7. ELATOSTEMA.
- Female perianth tubular, shortly toothed  
 or subentire, enclosing the achene :—  
 Fruiting perianth dry, membranous ;  
 stigma filiform :—  
 Stigma persistent—Shrubs or small  
 trees . . . . . 8. BOEHMERIA.
- Stigma jointed to apex of ovary,  
 deciduous—Herbs or under  
 shrubs . . . . . 9. POUZOLZIA.
- Fruiting perianth more or less  
 fleshy :—  
 Stigma sessile, subpeltate,  
 ciliate . . . . . 10. VILLEBRUNEA
- Stigma penicillate . . . . . 11. DEBREGEASIA.
- Female perianth none ; flowers minute,  
 in small cymose globose heads ;  
 stigma penicillate.—A shrub with  
 the leaves snowy-white beneath. . . . . 12. MAOUTIA.

Plants with milky juice :—

Anthers in bud reversed ; stamens inflexed ;  
ovules pendulous, anatropous.—Shrubs or  
trees :—

Female sepals fleshy and confluent in  
fruit, enclosing the achenes ; styles 2-  
fid. ; flowers many, in spikes, or the  
fem. flowers subcapitate . . . . .

13. MORUS.

Female sepals not fleshy in fruit—A  
small tree or shrub with very rough  
leaves . . . . .

14. STREBLUS.

Anthers in bud erect :—

Flowers all exposed ; inflorescence con-  
gested in globose or oblong heads :—

Flowers dioecious, in small globose heads ;  
stamens 4.—A subscandent spine-  
scent shrub . . . . .

15. CUDRANIA.

Flowers monœcious, in large oblong  
heads ; stamen 1.—Erect evergreen  
unarmed trees . . . . .

16. ARTOCARPUS.

Flowers attached to the inner walls of  
a closed receptacle, monœcious  
rarely dioecious.—Trees or erect or  
climbing shrubs, often epiphytic . . . . .

17. FIGUS.

# 1. HOLOPTELEA, Planch. ; Fl. Brit. Ind. v, 481.

A large deciduous tree. *Leaves* alternate, distichous, penni-  
nerved, entire ; stipules lateral, scarious. *Flowers* polygamous  
or 2-sexual, the males without a rudimentary ovary, arranged in  
fascicles at the scars of the previous year's shoots which are scaly  
but leafless. *Perianth* simple, calycine, 4-8-partite ; lobes imbricate,  
often unequal. *Stamens* 4-8, usually 6-8 ; filaments erect, at  
length exserted, anthers hairy. *Ovary* stipitate, compressed ;  
style short, 2-fid., the arms stigmatose within throughout their  
length ; ovule solitary, pendulous. *Fruit* dry, indehiscent, sama-  
roid or flat, the nucleus expanded into an obliquely ovate reticulate  
wing. *Seed* flat, albumen none, cotyledons longitudinally com-  
plicate ; radicle small, superior—A single species, confined to  
India, Ceylon and Cochin China.

**H. integrifolia**, *Planck.* in *Ann. Sc. Nat. Ser. 3*, 259; *F. B. I. V.*, 481; *Watt E. D.*; *Kanjilal For. Fl.* (ed. 2) 360; *Amble Man.* 628; *Prair Beng. Pl.* 958; *Cooke Fl. Bomb. ii.* 629; *Brandis Ind. Trees* 595. *Ulmus integrifolia*, *Willd.*; *Roxb. Fl. Ind. ii.* 68; *Royle Ill.* 341; *Brandis For. Fl.* 431.—*Vern. Pāpri, banchilla* (Saharanpur), *Kunj* and *dhamna* (Oudh), *chilla* (Bundelkhand). Indian Elm.

A large spreading almost glabrous deciduous tree. *Bark* grey; branchlets lenticellate; young shoots often pubescent. *Leaves* more or less coriaceous, or sometimes almost membranous, 3-5 in. long, elliptic, acuminate, entire (those of the seedlings and shoots often serrate), glabrous and shining or sometimes pubescent beneath; base unequally rounded or subcordate; main lateral nerves 5-7 pairs; petioles about  $\frac{1}{2}$  in. long. *Flowers*  $\frac{1}{2}$  in. across. *Perianth* pubescent; segments 4-5-partite. *Stamens* usually 6 or 7; filaments glabrous, anthers pubescent. *Ovary* stalked, compressed, the jointed stalk lengthening as the fruit ripens; styles stigmatic on the inner side. *Samara* obliquely elliptic or suborbicular, about 1 in. in diam.; wing reticulately veined, notched at the apex.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Bundelkhand and in the forest tracts of Merwara. It is frequently met with near villages and in many gardens, within the area of this flora. The new leaves appear in March and April soon after the tree has flowered, and the fruit, which ripens during the hot season, remains for a long time on the tree. *DISTRIB.*: Outer Himalayan ranges from Jamu eastwards up to 2,000 ft., extending to Assam and Burma, and southwards from Bengal through Central, Western and South India to the dry region of Ceylon. The wood is used chiefly for fuel and charcoal. It emits a very unpleasant odour when freshly cut.

## 2. **CELTIS**, Linn.; *Fl. Brit. Ind. V.* 481.

Trees or shrubs, sometimes evergreen. *Leaves* alternate, bifarious, ovate, entire or serrate, base 3-nerved; stipules lateral, free. *Flowers* small, polygamous, solitary or cymose, male and androgynous cymes usually at the base of the shoots, the females in the upper axils. *Sepals* 4 or 5, imbricate. *Petals* none. *Stamens* 4 or 5, short, erect in bud, inserted round a woolly torus. *Ovary* sessile; style central, arms simple or lobed, plumose, ovule pendulous. *Fruit* a small ovoid or globose drupe; endocarp

hard, smooth or rugose. *Seed* with a membranous testa, albumen scanty or none, embryo curved; cotyledons broad, inflexed flat or replicate, surrounding the upcurved radicle.—Species about 60, in temperate and tropical regions chiefly in the N. Hemisphere.

**C. australis**, Linn. *Sp. Pl.* 1043; *Brandis For. Fl.* 423, t. 50; *Ind. Trees* 595; *F. B. I. V.*, 482; *Watt, E. D.*; *Kanjilal For. Fl.* (ed. 2), 366; *Gamble Man.* 629; *Collett Fl. Siml.* 455. *C. caucasica*, Willd.; *J. L. Stewart in Journ. Agri-Hort. Soc. Ind. xiii*, pt. 3, 299.—Vern. *Kharak, Kharak-chena* (Dehra Dun).—Nettle-tree.

A medium-sized deciduous tree with bluish-grey or brown bark which is often speckled with whitish dots and in large trees horizontally wrinkled; branchlets drooping; young branches, leaves and petioles more or less hairy. *Leaves* 3-5 in. long, obliquely ovate or ovate-lanceolate, acuminate, serrate or entire towards the base, rough and coriaceous when full-grown, dark-green and glabrous on upper surface; base acute or rounded, sometimes oblique and with 3 strong nerves, midrib penninerved above; petioles  $\frac{1}{2}$  in., stipules subulate, shorter than petioles, caducous. *Flowers* pale-yellow, the females in the upper axils, long-pedicelled rather larger than the males. *Sepals* oblong, with woolly margins, deciduous. *Ovary* woolly. *Drupe* yellowish or black, ovoid or subglobose,  $\frac{1}{2}$  in. in diam. or less, its pedicel  $\frac{1}{2}$ -2 in., putamen rugose.

Dehra Dun, both planted and self-sown; it is probably wild in the forests of N. Oudh, (Wallich, Duthie; and in the Bijnor forests of Rohilkhand (Stewart). *Flowers* March-May, often before the leaves appear. *DISTRIB.*: W. Himalaya eastwards to Nepal up to 8,000 ft.; Punjab, on the Salt range; extending to Chitral, Afghanistan, Baluchistan, and westwards to S. Europe. The wood is strong and tough and is used in the manufacture of oars, whip-handles; agricultural implements, etc. In the south of France and in Spain the tree is much cultivated for such purposes. The sweet fruit is sometimes eaten, and the leaves are much used for fodder. The villagers on the lower slopes of the North-West Himalaya very frequently store their winter supplies of fodder in the forks of the branches of this tree.

### 3. TREMA, Lour.; Fl. Brit. Ind. V, 483.

Shrubs or trees. *Leaves* alternate, 3-7-nerved at the base; stipules lateral, caducous. *Flowers* monœcious subdioecious or



polygamous, in small axillary cymes. *Perianth* simple. MALE flowers. *Sepals* 4 or 5, induplicate-valvate or subimbricate. *Stamens* 4 or 5, erect in bud. *Pistillode* small or none. FEM. flowers. *Sepals* as in male when stamens are present, flat and subimbricate in the absence of stamens. *Ovary* sessile; style central, with 2 linear arms, ovule pendulous. *Fruit* a small straight ovoid or subglobose drupe, usually tipped by the style, endocarp hard. *Seed* small, testa membranous, albumen fleshy, cotyledons narrow, radicle ascending.—Species about 20, in tropical and sub-tropical regions of the world.

Leaves distinctly unequal at the base, softly  
 pubescent beneath . . . . . 1. *T. orientalis*.  
 Leaves almost equal at base, very scabrid on  
 both surfaces . . . . . 2. *T. politoria*.

1. *T. orientalis*, Blume Mus Bot. ii, 62; F. B. I. V., 484; Watt, E. D., Kanjilal For. Fl. (ed. 2), 361; Gamble Man. 630; Prain Beng. Pl. 960; Cooke Fl. Bomb. ii, 631; Brandis Ind. Trees 597. *Sponia orientalis*, Planch.; Royle Ill. 341; Brandis For. Fl. 430. *Celtis orientalis*, Linn.; Roxb. Fl. Ind. II, 65;—Indian Nettle-tree or Charcoal-tree.

A small quick-growing short-lived evergreen tree; bark thin, dark-grey, with many lenticels. Branches spreading, straight; branchlets hairy. Leaves 2-3 in. long, obliquely ovate, acuminate, crenate-serrulate, rather rough on the upper surface, soft beneath with white pubescence; base unequally rounded or subcordate, 3-nerved, lateral nerves above the basal ones 3-4 pairs; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in.; stipules as long as the young petioles, deciduous. Cymes lax, spreading, pubescent, usually exceeding the petioles. MALE FLOWERS: *Sepals* elliptic-lanceolate. *Stamens* 5, longer than the sepals. *Pistillode* small. FEM. FLOWERS: *Sepals* as in the male. *Drupe* ovoid,  $\frac{1}{4}$  in. in diam., glabrous, black when ripe.

Dehra Dun, usually in swampy ground and eastwards along the Sub-Himalayan forest tracts of N. Oudh and Gorakhpur. Flowers during the greater part of the year. DISTRIB.: More or less throughout India, extending to Ceylon, the Malay Islands and China. This tree is remarkable for its sudden appearance in clearings of moist forest; it is also very useful for planting on landslips. The wood produces a good charcoal suitable for making gunpowder, and the inner bark yields a strong fibre much used for binding loads.

**2. T. politoria**, *Planch. in Ann. Sc. Nat. Ser. 3, X, 326; Ind. Trees 597; F. B. I. V., 484; Kanjilal For. Fl. (ed. 2) 362; Gamble Man. 631; Collett Fl. Siml. 456; Prain Beng. Pl. 960. Sponia politoria Planch.; Brandis, For. Fl. 430.*—Vern. *Kagshi, kuri* (Dehra Dun), *Khardâ* (Saharanpur), *jaun* and *bâtu* (Bijnor), *banharria* (Oudh) *rabna* (Merwara).

A small sparingly branched evergreen tree with a short trunk and stout branchlets which are scabrid with firm white hairs swollen at the base. *Leaves* bifarious, 2-5 in. long, oblong or ovate-lanceolate, acuminate, serru late, very scabrous on both surfaces, dark-green and usually shining above, paler beneath; base nearly equal, rounded or cordate, 3-nerved; petiole  $\frac{1}{4}$  in. long, stipules exceeding the petioles. *Flowers* in compact cymes, usually monœcious. *Drupe* globose, seated on the persistent perianth.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also in Merwara (Lowrie). *Flowers* April-June. *DISTRIB.*: Salt range of Punjab and lower Himalayan valleys eastwards to Bhutan; Bengal, C. India and Mt. Abu in Rajputana. This tree, like the preceding, is very useful for planting on landslips. The foliage affords good fodder for cattle, and the inner bark yields a strong fibre. The hard rough leaves are much used for polishing wood and ivory.

#### 4. CANNABIS, Tournef.; Fl. Brit. Ind. V, 487.

A tall annual. *Leaves* alternate or the lower opposite, upper 1-3-, lower 5-11-partite, penninerved; lobes lanceolate, serrate; stipules lateral. *Flowers* small, diceious, rarely monœcious; males in axillary panicked cymes; females in axillary racemes; bracts in females convolute, leafy. *MALE flowers. Sepals* 5, imbricate. *Stamens* 5, erect in bud; filaments filiform, anthers oblong. *Pistillode* none, *FEM. flowers. Perianth* hyaline, embracing the base of the ovary. *Ovary* sessile, of 2 carpels, 1 fertile and 1 sterile, 1-locular; *ovule* pendulous, reversed, campylotropous; style central; arms 2, filiform, caducous. *Fruit* a somewhat compressed crustaceous nut. *Seed* somewhat flattened; albumen unilateral, fleshy, embryo curved; cotyledons broad, thick; radicle upcurved, incumbent.—A single species, wild in Central Asia, and possibly in Northern India.



*C. sativa*, Linn. ; Roxb. *Fl. Ind.* iii, 772 ; Royle *Ill.* 333 ; Madden in *Journ. As. Soc., Beng.* xvii (1848), pl. 1, 399 ; A. DC. *L'Orig. Pl. Cult.* 117 ; Duthie and Fuller in *Field and Gard. Crops* i, 80, t.t. 19 and 20 ; Watt E. D. ; *Comm. Prod. Ind.* 249 ; F. B. I. V, 487 ; *Kanjilal For. Fl.* (ed. 2) 385 ; Collett *Fl. Siml.* 456 ; *Prair* *Beng. Pl.* 960 ; in *Sc. Memb. Med. Depmt.* (New ser. 1904) No. 12 ; —Cooke *Fl. Bomb.* ii, 659. Vern. *Bhang, siddhi, ganja, charas*. (Hemp).

Abundant throughout the greater part of India in waste ground and by roadsides ; also widely distributed up to considerable elevations on the Himalaya, especially in the vicinity of habitations and on the sites of much frequented camping grounds along the principal trade-routes leading to C. Asia. For this reason it is difficult to ascertain to what extent, if at all, this plant may be regarded as truly indigenous in British India. The following are the more important products derived from this plant :—*charas, bhang, ganja*, also the fibre and the seeds. *Charas* is the narcotic resinous substance which appears on the stems and inflorescence, and is collected chiefly from cultivated female plants. This substance is imported into India chiefly from C. Asia where the drier climate is more suitable for its cultivation. *Bhang* consists of the dried leaves and flowers and is largely prepared in India, as also is *ganja*, the name given to the dried flowering tops of the cultivated female plant. Both *bhang* and *ganja* are often mixed with tobacco and smoked. The cultivation of the plant for its fibre (hemp) is mainly restricted to some of the warm valleys of the W. Himalaya between Nepal and Kashmir. The male plant yields the best fibre and is always cultivated, as the fibre yielded directly by the wild-growing plant is worthless. Hemp seeds are well known as a favourite food of cage-birds, and in India they are often roasted and eaten by the Himalayan villagers. For further information regarding this plant see Watt in *Commercial Products of India*, p. 249.

##### 5. GIRARDINIA, Gaud. ; *Fl. Brit. Ind.* V, 550.

Herbs or undershrubs with stout stinging hairs. *Leaves* alternate, 3-nerved, entire or lobed, serrate ; stipules connate, foliaceous. *Flowers* in clusters, monœcious or sometimes dioecious ; clusters in simple or paniced spikes or heads, armed with stinging hairs. *Pervanth* simple. *MALE flowers.* *Sepals* 4-5, valvate. *Stamens* 4-5, intlexed in bud, filaments free. *Pistillode* globose or oopular.

FEM. flowers. *Perianth* tubular, ventricose, 2-3-toothed, at length splitting on one side and spathe-like. *Ovary* straight; stigma subulate, papillose, ovule erect. *Fruit* a broad compressed achene, seated on the perianth, pericarp rather thick. *Seed* with a membranous testa, albumen scanty, cotyledons broad.—Species 7, in Trop. Asia and Africa.

*G. heterophylla*, Dcne. in Jacquem. Voy. Bot. 151, t. 153; Brandis For. Fl. 404; F. B. I. V, 550; Kanjilal For. Fl. (ed. 2) 384; Gamble Man. 656; Collett Fl. Siml. 162, fig. 149; Watt Comm. Prod. Ind. 161. *Urtica heterophylla*, Willd.; Roxb. Fl. Ind. iii, 586.—Vern. Bichua, chichru, kushki.

A coarse erect perennial herb 4-10 ft. high, closely beset with slender rigid sharp stinging hairs. *Leaves* 4-12 in. long and often as broad, broadly ovate, acuminate; base cordate or truncate; margins usually sharply and falcately dentate, rarely entire; under surface usually glabrous except for the bristly stinging hairs on the nerves; petioles 3-6 in. long, densely armed with stinging hairs; stipules about  $\frac{1}{2}$  in. long, ovate. *Flowers* small, monœcious, densely crowded. *MALE flowers* in long slender often panicle spikes. *Perianth* 4-partite. *Stamens* usually 4. *Pistillode* globose. *FEM. flowers* crowded in simple or panicle spikes and usually forming a stout densely bristly inflorescence up to 6 in. long or more. *Perianth*  $\frac{1}{10}$  in. long, 3-lobed, splitting when the fruit ripens; lobes triangular, acute. *Style* filiform. *Achenes*  $\frac{1}{2}$  in. long, flat, obliquely ovate.

Abundant in Dehra Dun and eastwards along the Sub-Himalayan tract. Flowers during the rainy season. **DISTRIB.**: Sub-tropical and temp. Himalaya from Kashmir to Sikkim, up to 7,000 ft.; also in Assam and the Khasia Hills, extending to Burma, Java and China. The stems yield a strong silk-like fibre which is used for making twine or ropes, and sometimes (in Sikkim) a coarse kind of cloth is made from it. The leaves are often used as a vegetable by the village people of the Western Himalaya.

**VAR. zeylanica**, F. B. I. I. c. 551. *G. zeylanica*, Dcne. l. c. 152; Prain Beng. Pl. 961; Cooke Fl. Bomb. ii, 633. *Urtica zeylanica*, Burm.—Leaves pinnatifidly lobed; margins rather bluntly serrate; stipules broadly cordate; female inflorescence (in fruit) densely compacted into oblong or reniform masses. This variety occurs in the dry south-western hilly portion of the area of this flora and extends through Central India and the Deccan to Travancore and Ceylon. It is often known as the *Nilgiri nettle*, which name, however,

should more correctly be referred to *G. palmata*, Gaud. (*G. heterophylla*, VAR. *palmata*, F. B. I. l.c.) as being the more prevalent variety found on the Nilgiris.

6. *PILEA*, Lindl. ; Fl. Brit. Ind. V, 551.

Herbs, rarely undershrubs. *Leaves* opposite, in equal or unequal pairs, entire or serrate, 3-nerved at the base, rarely penninerved; stipules connate, intrapetiolar. *Flowers* minute, monœcious or dioecious, in axillary long or short peduncled dichotomously branching cymes, bracts small or none. *Perianth* simple. *MALE* flowers. *Sepals* 2-4, free or connate in a cup, often gibbous or horned on the back. *Stamens* 2-4. *Pistillode* conical or oblong. *FEM. flowers.* : *Sepals* 3, rarely 4, very small and unequal, dorsal longest, sometimes gibbous or hooded. *Staminodes* minute and scale-like or none. *Ovary* straight; stigma sessile, pennicillate, ovule erect. *Fruit* an ovoid or oblong compressed membranous or crustaceous achene, sometimes clasped at the base by the persistent sepals. *Seed* erect, testa thin, albumen very scanty, cotyledons broad.—Species about 100, tropical or sub-tropical, none found in Australia.

*P. pepioides*, Hook. and Arn. Bot. Beech. Voy. 96; F. B. I. v, 554.

A very small tufted glabrous herb, branching from the base. *Stems* or branches 3-5 in. long, succulent, flaccid. *Leaves*  $\frac{1}{2}$  in. long and broad, orbicular-ovate, rounded at the apex, entire or crenate above the middle; base cuneate, 3-nerved; petiole as long as the blade; stipules obscure. *Flowers* minute, indense sessile androgynous, globose heads  $\frac{1}{2}$  in. in diam. *Schenes* very minute sub-globose, smooth.

In the Kheri district of N. Oudh, and in the Gorakhpur district (Duthie's collectors). *DISTRIB.* : From the Punjab Himalaya to the Sikkim Terai also in Cachar and Burma, extending to China, Japan, Java and to the Sandwich and Galapagos Islands.

*P. Muscosa*, Lindl. A minute creeping herb with entire penninerved leaves is often found as a garden weed in damp places and is known as the *Gunpowder Plant* owing to the profuse discharge of pollen from the anthers when the plant is shaken. It has been introduced from S. America.

7. **ELATOSTEMA**, Forst., Fl. Brit. Ind. V, 562.

Herbs or undershrubs. *Leaves* alternate or with sometimes a minute leaf sub-opposite to the normal leaf, distichous, sessile or sub-sessile, usually very oblique and unequal-sided, 3-nerved at or near the base; stipules lateral or intrapetiolar. *Flowers* very minute, crowded on sessile or peduncled unisexual usually involucrate receptacles; bracts oblong or ovate, the outer sometimes with a dorsal spur or horn, bases nearly free or more or less confluent in a fleshy circular or lobed disk, the tips usually projecting from its margin; bracteoles densely crowded, those of the male heads usually oblong, of the females spatulate; florets often in clusters, each cluster surrounded by a partial bract, giving the head a lobed appearance. **MALE** flowers. *Sepals* 4 or 5, two or more usually tubercled or spurred on the back. *Stamens* 4 or 5, inflexed in bud. *Pistillode* minute. **FEM.** flowers: *Sepals* 3-5, very minute, much shorter than ovary, persistent. *Staminodes* minute or none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* a minute ellipsoid or fusiform usually ribbed achene subtended by the very minute perianth. *Seed* usually exalbuminous, testa membranous, cotyledons ovate or semiterete.—Species about 50, tropics of the Old World except in Australia.

**E. sessile.** Forst. Char. Gen. 106, VAR. *polycephala*, Hk. f. in F. B. I. V, 563; Collett Fl. Siml. 466. *Procris punctata*, B.-Ham. in Don Prod. 61.

Stem 1-2 ft., often bent at the joints, prostrate and rooting below. *Leaves* sessile or nearly so, membranous, 4-8 in. long, obliquely oblanceolate or oblong, coarsely serrate, the tip caudate, bright green when dry, cystoliths abundant on upper surface. *Receptacles* solitary or 2-3 together,  $\frac{1}{4}$ - $\frac{1}{2}$  in. diam., the males sessile, the fem. shortly stalked and without involucre bracts; bracteoles very minute, villous, hyaline. *Achenes* very minute, ellipsoid, acute at both ends, ribbed.

Dehra Dun, in shady ravines. **DISTRIB.**: Himalaya from the Punjab eastwards and up to 8,000 ft.; also in Assam, and southwards to the Nilgiri Hills and Ceylon; extending to trop. Africa, the Malay and Pacific Islands, China and Japan.

## 3. BOEHMERIA, Jacq.; Fl. Brit. Ind. V, 575.

Shrubs or small trees. *Leaves* opposite or alternate, toothed, 3-nerved at the base; stipules usually free, deciduous. *Flowers* monoecious or dioecious, both sexes in axillary spicate racemed or panicle clusters; bracts small, scarious. *MALE flowers*: *Perianth* 3-5-lobed or partite, valvate. *Stamens* 3-5, inflexed in bud. *Pistillode* clevate or globose. *FEM. flowers*: *Perianth* tubular; 2-4-toothed, angled winged or ventricose in fruit. *Ovary* included; stigma filiform, persistent, ovule erect. *Fruit* a crustaceous achene, at first closely invested by the perianth, at length free. *Seed* with membranous testa, albumen copious or scanty, cotyledons ovate.—Species about 45, chiefly tropical.

Leaves all alternate—A tree . . . . . 1. *B. rugulosa*.

Leaves mostly opposite—Shrubs:—

Leaves lanceolate; petioles up to one inch long . . . . . 2. *B. macrophylla*.

Leaves broadly ovate or orbicular; petioles exceeding one inch:—

Female spikes long, overtopping the terminal leaves . . . . . 3. *B. platyphylla*.

Female spikes short, erect, not overtopping the terminal leaves . . . . . 4. *B. scabrella*.

1. *B. rugulosa*, Wedd. in Ann. Sc. Nat. Ser. 4, i, 200; Brandis For. Fl. 403; Ind. Trees 617; F. B. I. V, 577; Kanjilat For. Fl. (ed. 2), 380; Amble Man. 657. *B. nervosa*, Madden in Journ. As. Soc. Beng. xvii, pt. 1, 587.—Vern *Geti, genthi* (Dehra Dun).

A small or medium-sized evergreen tree; young parts and under surface of leaves hoary; branches terete; bark brown, deeply fissured. *Leaves* alternate, coriaceous, 3-5 in. long, elliptic-lanceolate, acuminate, crenulate, rugulose and dark-green above, paler or velvety pubescent beneath strongly 3-nerved, the intervening veins and veinlets conspicuously anastomosing; petiole  $\frac{1}{2}$ -1 in. long; stipules ovate, connate. *Flowers* dioecious, in sessile globose clusters forming simple axillary spikes 3-8 in. long, each cluster in the axil of a cordate bract.

Dehra Dun, in shady ravines and eastwards along the Sub-Himalayan tracts. Flowers in the rainy season. *DISTRIB.*: Outer Himalayan ranges from the Sutlej to Bhutan, ascending to 4,000 ft.; also in Upper Burma.



The wood of this tree is much used by the villagers of Garhwal and Kumaon in the manufacture of many of their household articles, such as cups, boxes, combs, etc., also the vessels which they employ for holding milk. The tree is highly recommended for planting on dry bare slopes, and should be protected where found growing naturally in such situations.

**2. *B. macrophylla*, Don. *Prod.* 60 ; *Brandis For. Fl.* 403 ; *Ind. Trees* 617 ; *F. B. I. V.* 577 ; *Watt E. D.* ; *Kanjilal For. Fl.* (ed. 2), 380 ; *Gamble Man.* 658.—Vern. *Bara siaru* (Dehra Dun).**

A short or small tree ; bark greyish-brown, rough with small lenticels ; branchlets stout, obtusely 4-angled, usually strigose. *Leaves* opposite, 6-12 in. long, lanceolate, caudate-acuminate, obtusely serrate, upper surface sparsely hispid, rugulose and pustular, softly or hispidly pubescent or glabrate beneath ; petiole  $\frac{1}{2}$ -1 in. long ; stipules lanceolate, midrib hairy. *Spikes* elongate, pendulous, leafless, simple or branched below. *Clusters* globose,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam. ; bracts lanceolate. *Fruit* obovate, cuneate, compressed, ciliate, with a 2-4-toothed neck.

Ravines on Nagsidh Hill in Dehra Dun (Kanjilal), and in river-beds eastwards along the Sub-Himalayan tract. Flowers Aug.-Sep. **DISTRIB.** : Sub-tropical Himalaya from the Jumna to Mishmi, up to 4,000 ft., and from the Khasia Hills south to Chota Nagpur ; also in Upper Burma and extending to China. The bark yields an excellent fibre of which fishing nets and lines are made.

**3. *B. platyphylla*, Don *Prod.* 60 ; *Brandis For. Fl.* 403 ; *Ind. Trees* 617 ; *F. B. I. V.* 578 ; *Watt E. D.* ; *Kanjilal For. Fl.* (ed. 2) 381 ; *Gamble Man.* 658 ; *Collett Fl. Siml.* 466.—Vern. *Siár* (Dehra Dun).**

A large shrub up to 12 ft. high, with dark-brown and rather rough branches. *Leaves* mostly opposite, 4-9 in. long, broadly ovate, cordate elliptic or suborbicular, acuminate or caudate, coarsely toothed, more or less rugose, sparsely hispid-pubescent or glabrate on both surfaces ; base 3-nerved ; petiole 1-5 in. *Flowers* dicæcious or monæcious. *Male spikes* often branching, generally not exceeding the leaves. *Fem. spikes* simple, far-exceeding the terminal leaves, becoming brown when achenes are ripe.

Shady ravines and banks of streams in Dehra Dun (Kanjilal), also in the Sub-Himalayan tracts eastwards. Flowers April-Aug. Widely distributed in India, and very variable, especially on the outer ranges of the Himalaya up to 5,000 ft. The bark yields a strong white fibre, and the foliage affords a good fodder for cattle.



4. *B. scabrella*, Gaud. in Freyc. Voy. 500; C. B. Clarke in Journ. Linn. Soc. XV, 124; Prain Beng. Pl. 964; Cooke Fl. Bomb. 636. *B. platyphylla* var *scabrella*, Wedd.; F. B. I. V, 578; Watt, E. D. *Urtica scabrella*, Roxb. iii, 581.

A shrub with soft glabrous or strigose branches. Leaves usually opposite,  $3\frac{1}{2}$ -7 in. long, broadly ovate obovate or sub-orbicular, acuminate or cuspidate, sharply serrate with triangular teeth, usually rugose and lacunose beneath; base rounded or cordate, 3-nerved; petioles  $\frac{1}{4}$  in. long; stipules lanceolate, acute. Flowers in small globose clusters on slender erect spikes. Male spikes crowded in the lower axils, the female spikes usually solitary, not exceeding the terminal leaves. MALE FLOWERS: *Sepals* 4, ovate, acuminate. FEM. FLOWERS: *Perianth*  $\frac{1}{5}$  in. long, pubescent, shortly contracted round the base of the persistent style into a small 4-toothed mouth. *Achenes* compressed, shining, closely invested by the turgid persistent perianth.

Dehra Dun and eastwards along the Sub-Himalayan tract. DISTRIB.: More or less throughout India from the outer Himalayan ranges; also in Ceylon.

*B. Nivea*, Gaud.; Brandis For. Fl. 402; F. B. I. V, 576; Watt E. D.; in Agril. Ledger No. 15 (1898); Comm. Prod. Ind. 143; Gamble Man. 657; Prain Beng. Pl. 964; Cooke Fl. Bomb. ii, 637. *Urtica nivea*, L.—This is the well-known *rheea* or China grass, a native of China, Japan and the Malay Islands. It yields a most valuable fibre and has been cultivated for several years in various parts of India. The expense, however, involved in its cultivation, and the difficulties met with in the extraction and preparation of the fibre have hitherto kept it in the background as a marketable fibre plant.

*B. Tenacissima*, Gaud. (*Urtica tenacissima*, Roxb.) is regarded by most authors as a tropical variety of the above, differing chiefly by having the under surface of its leaves green instead of pure white. It is found wild in the Malay Peninsula and its native name is *râmi*.

### 9. *FOUZOLZIA*, Gaud.; Fl. Brit. Ind. V, 580.

Herbs or undershrubs. Leaves alternate or the lower, rarely all, opposite, usually entire, 3-nerved at the base, smaller upwards,

the uppermost often reduced to bracts; stipules free, often persistent. *Flowers* minute, usually monœcious, in 1-sexual or androgynous clusters sessile in the axils of the leaves or bracts, bracteoles small, individual florets pedicelled. *MALE flowers*: *Perianth* 4 or 5-partite or lobed, rarely 3-part; lobes valvate, with concave or abruptly inflexed tips and transversely plicate bracts. *Stamens* 4 or 5, rarely 3. Pistillode clavate or oblong. *FEM. flowers*: *Perianth* tubular, often beaked; mouth contracted, 2-4-toothed, *Ovary* included, stigma filiform, jointed at the top of the ovary, soon deciduous, ovule erect. *Fruit* a small achene with brittle shining pericarp, enclosed in but usually free from the marcescent perianth. *Seed* with membranous testa, albumen very scanty or none, cotyledons ovate.—Species about 50, in the tropics of the Old World.

Lobes of male perianth usually 4, convex or gibbous on the back; stamens 4, rarely 5:—

Leaves toothed—A small shrub . . . 1. *P. viminea*.

Leaves quite entire—A perennial herb . . . 2. *P. indica*.

Lobes of male perianth 5, abruptly inflexed above the middle; stamens 5—A perennial herb . . . . . 3. *P. pentandra*.

1. *P. viminea*, Wedd. in DC. *Prod.* xvi, i, 228; Brandis *For. Fl.* 405; Ind. *Trees* 617; F. B. I. V, 581; Kanjilal *For. Fl.* (ed. 2), 381, *Camble Man.* 658. Collett *Fl. Siml.* 467; Boehmeria frondosa, Don *Prod.* 59.

A small shrub with slender virgate pubescent or strigose branchlets. *Leaves* alternate,  $\frac{1}{2}$ -5 in. long, ovate or oblong-lanceolate, acuminate, dentate, smooth or scaberulous on the upper surface, strigose or pubescent beneath and often with a grey or white tomentum; base 3-nerved; petioles  $\frac{1}{2}$ -2 in. long, strigose. *Perianth* of male flowers 4-partite; segments convex on the back. *Stamens* 4. *Fruit* angled or obscurely margined.

Dehra Dun, in moist shady ravines. Flowers during the rainy season. *DISTRIB.*: Himalaya from the Sutlej eastwards to Sikkim, ascending to 7,000 ft.; also in Burma, Assam and in the Malay Peninsula and Islands. The leaves are eaten in Sikkim by the Lepchas as a cooked vegetable. The bark yields a fibre suitable for making ropes.

**2. *P. indica*, Gaud. in Freyc. Voy. 503; F. B. I. V., 581; Collett Fl. Siml. 467; Prain Beng. Pl. 965; Cooke Fl. Bomb. ii, 638. *Urtica suffruticosa*, Roxb. Fl. Ind. iii, 584.**

A perennial herb, very variable as to size and habit, glabrous, hoary or pubescent. *Stem* erect or prostrate, 6-20 in., stout or slender. *Leaves* opposite or alternate,  $1\frac{1}{2}$  in. long, ovate to lanceolate, obtuse, acute or acuminate, entire, hairy; base acute or rounded; lateral nerves 1 pair above the 3 basal ones; petioles  $\frac{1}{4}$  in.; stipules ovate, acuminate, ciliate. *Flowers* strigose with simple or hooked hairs. **MALE FLOWERS:** *Sepals* 4, dorsally rounded, acute. *Stamens* 4. *Pistillode* small, clavate. **FEM. FLOWERS:** *Perianth* tubular, persistent, ribbed, 2-fid. at the apex, closely investing the achenes. *Achenes*  $\frac{1}{10}$  in. long, broadly ovoid, shining.

Abundant within the area and often met with as a garden weed. **DISTRIB.:** Throughout trop and sub-trop. India and in Ceylon, ascending to 7,000 ft. on the Himalaya; eastwards to Burma and south to Malay Peninsula and Islands, also in China.

**VAR. *alienata*, Wedd. in F. B. I. V. lc. P. nana, Don Prod. 60. *Urtica alienata*, Linn.; Roxb. Fl. Ind. iii, 582.** It differs from the type in having the leaves mostly opposite, long-petioled and ovate, and the leaf-base is usually rounded. It is said to be common in India, but I have seen no specimens from the Upper Gangetic Plain.

**3. *P. pentandra*, Benn. Pl. Jav. Rar. 64, t. 14; F. B. I. V, 583; Watt E. D.; Collett Fl. Siml. 468; Prain Beng. Pl. 965; Cooke Fl. Bomb. ii, 638. *Urtica pentandra*, Roxb. Fl. Ind. iii, 583.**

A tall erect glabrous perennial herb, 2-3 ft. high; stem terete below, usually angular above, diffusely branched. *Leaves* sessile or shortly stalked; the lower opposite, 1-4 in. long, oblong-lanceolate, acute or acuminate, strongly 3-nerved, ciliate; the upper much smaller than the lower ones and mostly alternate, linear-oblong, acuminate or cuspidate, exceeding the flower-clusters, the base often cordate. *Flowers* in clusters in the axils of the floral leaves (bracts) of an erect or nodding terminal spike up to 18 in. long. **MALE FLOWERS** stalked, truncate in bud, ciliate. *Perianth* 5-partite. *Stamens* 5. **FEM. FLOWERS:** *Perianth* (in fruit) with 2 or 3 broad lateral wings.

Dehra Dun (Gamble and Duthie), Pilibhit (Duthie), Gorakhpur (Burkill). **DISTRIB.** Trop. Himalaya from Kangra eastwards to Assam Khasia Hills and Bengal and south to Orissa and Kanara, extending to Afghanistan, Java and China. A very variable species of which four varieties are described in Fl. Br. Ind.

**10. VILLEBRUNEA**, Gaud. ; Fl. Brit. Ind. V, 589.

Trees or shrubs. *Leaves* alternate, petioled, entire or crenulate penninerved or 3-nerved at the base; stipules partially connate intrapetiolar. *Flowers* dioecious, densely capitately fascicled, fascicles solitary or laxly cymose; bracts small, often linear; bracteoles cup-shaped, sometimes connate. **MALE** flowers: *Perianth* 4-partite; segments ovate, acute, valvate or slightly imbricate, subglobose in bud. *Stamens* 4; *Pistillode* obovate—clavate. **FEM.** flowers. *Perianth* tubular, adnate to the ovary; mouth narrowed, minutely toothed. *Ovary* erect, covered by the adherent perianth; stigma sessile, small or discoid, ovule erect. *Fruit* a crustaceous achene, adnate to the slight fleshy perianth. *Seed* straight, often acuminate, testa membranous, albumen usually scanty, cotyledons broadly ovate.—Species about 8, in India and the Malay Archipelago extending to Japan.

**V. frutescens**, Blume *Mus. Bot. Lugd.* ii, 168; Brandis *For. Fl.* 406; *Ind. Trees* 610; *F. B. I. V.*, 590; Watt *r. D.*, *Kanjilal For. Fl.* (ed. 2), 382; *Gamble Man.* 659; *Collett Fl. Siml.* 468. *Urtica frutescens*, Roxb. *Fl. Ind.* iii, 589.

A shrub or small tree with slender pubescent branches; bark dark-grey, rough. *Leaves* membranous, 4-8 in. long, elliptic, oblong lanceolate or ovate, rarely suborbicular, acuminate or caudate, crenulate except towards base; base rounded or subcordate, 3-nerved to the middle and penninerved above, sparsely close on the upper surface, grey or white beneath with woolly hairs, or glabrate; petioles  $\frac{1}{2}$ -4 in. long; stipules  $\frac{1}{2}$  in., lanceolate, pubescent. *Flowers* in subsessile clusters or short cymes in the axils of the previous year's leaves. *Fruit* of many minute dry ovoid nuts, surrounded at the base by the fleshy perianth and bracteoles.

Dehra Dun, often found by the sides of water-courses, and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. **DISTRIB.** : Outer Himalayan ranges from the Sutlej to Sikkim, ascending to 5,000 ft.; also in Assam and on the Khasia Hills, and on the Nilgiris in S. India, extending to China and Japan. The fibre is used for ropes.

**11. DEBREGEASIA**, Gaud. ; Fl. Brit. Ind. V, 590.

Shrubs or trees. *Leaves* alternate, petioled, serrate-crenate, 3-nerved at the base; stipules connate, intrapetiolar, 2-fid. *Flowers*

monœcious or dicecious, in dense globose paniced spicate or sessile clusters, bracts of male clusters scarious. MALE flowers: *Perianth* usually 4 (rarely 3 or 5)-partite, lobes valvate. *Stamens* 4, rarely 3 or 5, inflexed in bud. *Pistillode* glabrous or woolly at the base. FEM. flowers: *Perianth* ovoid or obovoid, with a contracted and minutely toothed mouth, succulent in fruit. *Ovary* straight, included; stigma sessile, pennicillate; ovule erect. *Fruit* an achene, at first adnate to the fleshy perianth. *Seed* with membranous testa, albumen copious or scanty, cotyledons short and broad.—Species 5, in Trop. Asia and Africa.

Flower-heads in 2-chotomous cymes; male sepals exceeding the bracteoles; leaves clothed beneath with ash-coloured tomentum . . . 1. *D. velutina*.

Flower-heads sessile or subsessile; male sepals shorter than the bracteoles; leaves clothed beneath with snow-white tomentum . . . 2. *D. hypoleuca*.

1. *D. velutina* Gaud. in Bot. Voy. Bonite t. 90; F. B. I. V, 590; Watt E. D.; Comm. Prod. Ind. 160; Kanjilal For. Fl. (ed. 2), 383; Gamble Man. 660; Cooke Fl. Bomb. ii, 640; Brandis Ind. Trees 618. *D. longifolia*, Wedd.; Brandis For. Fl. 405.—Vern. *Tushiári, siáru* (Dehra Dun).

A tall erect shrub or small tree; bark thin, brown, rough; branches and petioles pubescent or tomentose. *Leaves* 2-7 in. long, linear or oblong-lanceolate, acuminate, serrulate, upper surface rugose, pubescent or scabrid and dark-green, veins prominently reticulate; lower surface ashy-tomentose; base rounded or acute, 3-nerved and with 2-3 pairs from the mid rib above; petioles  $\frac{1}{2}$ -1 $\frac{1}{4}$  in.; stipules scarious, 2-fid. *Flowers* in compact heads, arranged in lateral 2-chotomous cymes. MALE FLOWERS: *Sepals* 4, exceeding the bracteoles. *Stamens* 4. FEM. FLOWERS: *Perianth* tubular, with a small 4-toothed mouth. *Fruiting clusters*  $\frac{1}{2}$  in. in diam., consisting of an aggregation of fleshy perianths and their contained achenes.

Dehra Dun and eastwards along the Sub-Himalayan tracts. Flowers during July and Aug. and the fruit ripens during the cold seasons. DISTRIB.: Sub-trop. Himalaya up to 5,000 ft. from Garhwal to Sikkim, also in Assam, and on the Khasia Hills; and from Konkan to S. India and Ceylon, extending to Java. The strong fibre yielded by the stems is used for ropes and bow-strings. The orange-coloured ripe fruit resembles a small raspberry and is eaten.



2. *D. hypoeluca*, Wedd. *Monogr.* 463, t. 15; *F. B. I. V.* 59, *Watt E. D.*; *Comm. Prod. Ind.* 160; *Kanjilal For. Fl.* (ed. 2) 383; *Gamble Man.* 660; *Collett Fl. Siml.* 468. *D. bicolor*, Wedd. *Brandis For. Fl.* 405. *Urtica bicolor*, Roxb. *Fl. Ind.* iii, 589; *Boehmeria salicifolia*, Don *Prod.* 60.—Vern. *Sansáru* (Dehra Dun).

A large shrub with a thin grey bark; branches and leaves beneath clothed with snow-white wool. *Leaves* somewhat coriaceous, 3-6 in. long, lanceolate or oblong-lanceolate, acuminate, serrulate, scabrid with minute round elevated white dots on the upper surface, densely clothed beneath with white tomentum; base rounded or acute; main nerves 3 from the base, and with 3-5 pairs from the midrib above; petioles  $\frac{1}{2}$ -1 in.; stipules 2-fid. *Flowers* usually dioecious, arranged in rounded sessile or subsessile axillary heads. **MALE FLOWERS:** *Sepals* 4, shorter than the bracteoles, white-tomentose outside. *Stamens* 4. **FEM. flowers:** *Perianth* tubular, narrowed to a minute 4-toothed mouth.

Dehra Dun and Siwalik range in the Bijnor district. Flowers in March and April and the fruit ripens June-Aug. **DISTRIB.:** Sub-tropical and Temp. Himalaya from the Sarda river in Kumaon westwards to the Indus, up to 6,000 ft.; also on the Punjab Salt range and extending to Afghanistan, W. Asia and Abyssinia. The fibre of the stems is much used for making ropes. The fruit becomes yellow when ripe and is eaten.

## 12. MAOUTIA, Wedd.; Fl. Brit. Ind. v, 592.

Shrubs. *Leaves* alternate, petioled, crenate, 3-nerved, white-tomentose beneath; stipules connate, intrapetiolar. *Flowers* minute, monœcious or sometimes androgynous, in small cymose globose heads. **MALE flowers:** *Perianth* 5-part., valvate, *Stamens* 5, inflexed in bud. *Pistillode* woolly. **FEM. flowers:** *Perianth* none. *Ovary* straight, stigma penicillate, ovule erect. *Fruit* an ovoid achene, with a crustaceous or fleshy pericarp. *Seed* with membranous testa, cotyledons elliptic or oblong. Species 8, in Trop. Asia and Polynesia.

**M. Puya**, Wedd. in *Ann. Sc-Nat. Sér.* 4, i, 193; *Royle Ill.* 333; *Brandis For. Fl.* 406; *Ind. Trees* 619; *F. B. I. V.* 592; *Watt E. D.*; *Comm. Prod. Ind.* 163; *Kanjilal For. Fl.* (ed. 2), 384; *Gamble Man.* 660. *Boehmeria frutescens*, Don *Prod.* 59 (not of Thunb.) Vern. *Pua, poi* (Hind.), *dhaul-kágshi* (Dehra-Dun)—Nepal Hemp.



A shrub, with dark-grey bark marked with vertical lines of brown lenticles; branches clothed with long soft hairs. *Leaves* membranous, 4-8 in. long, elliptic, caudate-acuminate, coarsely dentate with large triangular teeth, scabrid above, intensely white beneath with densely matted soft hairs except on the pubescent nerves, prominently 3-nerved from the rounded or subacute base, and with 3-4 pairs of lateral nerves from the midrib above; petioles 1-5 in. long; stipules lanceolate, 2-fid. *Flowers* minute, in small round unisexual or androgynous heads which are arranged in slender axillary and terminal cymose panicles shorter than the petioles. *Achenes* gibbously ovoid, trigonous, hispid.

Dehra Dun, and Siwalk Range, in ravines and on banks of streams; also eastwards along the Sub-Himalayan tract. Fl. and fr. May to November. *DISTRIB.*: Outer Himalaya eastwards from Garhwal up to 4,000 ft.; also on Khasia Hills and extending to Burma and Japan. The plant yields a strong fine white fibre suitable for making fishing nets and lines, and was formerly known as the wild *rhea* of Sikkim.

### 13. MORUS, Linn. ; Fl. Brit. Ind. v, 491.

Trees or shrubs with milky juice. *Leaves* alternate, entire or toothed or 3-lobed, base 3-5-nerved; stipules small, lateral, caducous. *Flowers* monœcious or diœcious, spicate. *MALE* flowers in elongate catkin-like spikes. *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud. Pistillode turbinate. *FEM.* flowers in long and cylindric, or in short oblong or subglobose spikes. *Sepals* 4, decussate, imbricate, accrescent and succulent in fruit. *Ovary* included, straight, 1-celled; style central, 2-part. or 2-fid.; ovule pendulous. *Fruit* of many achenes enclosed in the succulent perianths and aggregated in berrylike spikes or heads. *Seed* subglobose, albumen copious, fleshy, embryo incurved; cotyledons oblong, equal, radicle ascending. Species about 10, in temperate and tropical regions.

1. *M. indica*, Linn. *Sp. Pl.* 986; Roxb. *Fl. Ind.* iii, 596; Royle *Ill.* 337; Brandis *For. Fl.* 408; *Ind. Trees* 612; F. B. I. V, 492; Watt *E. D.*; *Comm. Prod. Ind.* 785; Kanjilál *For. Fl.* (ed. 2) 365; Gamble *Man.* 635; *Prair. Beng. Pl.* 968; Collett *Fl. Siml.* 457; Cooke *Fl. Bomb.* ii, 658; *M. parvifolia*, Royle l. c.—Vern. *Tut, tutris* *sia tut, sia tunt*. Small-leaved mulberry.

A deciduous tree or shrub. *Leaves* ovate, caudate-acuminate, coarsely and unequally serrate, 2-5½ in. long, pubescent. or scabrous when old. *Male spikes* lax, on short slender peduncles. *Fem. spikes* short, ovoid. *Sepals* 4, the two inner flat or concave, the outer ones more less keeled; styles long, hairy, connate high up. *Fruit* dark-purple when ripe.

Wild on the outer Himalayan ranges up to 7,000 ft., and on the Sub-Himalayan tract eastwards to Sikkim and Upper Burma. It is largely cultivated as a shrub in Bengal and Burma for feeding silk-worms, as well as on the Nilgiri Hills. In N. India the new foliage and flowers appear in February and March and the fruit ripens in May. The wood is hard and close-grained.

2. *M. laevigata*. Wall. Cat 4649; Royle Ill. 337; Brandis For. Fl. 409; Ind. Trees 613; Gamble Man. 636; Prain Beng. Pl. 968; Cooke Fl. Bomb. ii, 658. *M. cuspidata*, Wall.-Vern. Tut.

A large or medium-sized tree; young shoots stipules and bud-scales clothed with long soft hairs. *Leaves* 3-7 in. long, ovate, cuspidate, finely serrate, often cordate at the base; petioles 1-1½ in. *Spikes* drooping, male spikes very hairy, the female almost glabrous. *Sepals* of fem. thin, two inner flat, outer ones keeled. *Styles* nearly free, papillose from base. *Fruit* long, cylindric, yellowish-white, insipid.

Tropical and subtrop. Himalaya from the Indus to Assam, wild and cultivated, ascending to 4,000 ft., also in Burma. A variety (*M. viridis*, B.-Ham.) with the leaves rounded at the apex is cultivated in Behar.

3. *M. alba*. Linn.; Royle Ill. 336; Roxb. Fl. Ind. iii, 594; DC. L'Orig. Pl. Cult. 119; Brandis For. Fl. 407, t. 47; Ind. Trees 612; F. B. I. V, 492; Watt E. D.; Comm. Prod. Ind. 784; Gamble Man. 634; Kanjilal For. Fl. (ed. 2) 364; Collett Fl. Siml. 457; Cooke Fl. Bomb. ii, 658. *M. tatarica*,—Vern. Tut, tutri, tuntri.—White Mulberry.

A small or medium-sized deciduous tree; young parts petioles and underside of leaves more or less pubescent. *Leaves* 2-3 in. long or more, ovate, acute, dentate or often lobed; upper surface usually glabrous; base cordate; petioles ½-1 in. *Flowers* on short ovoid spikes, monœcious, the male and female often on distinct branches. *Sepals* of fem. fls. 4, the two inner flat or concave, the outer ones keeled. *Styles* free. *Fruiting spikes* white or red, sweet.

This is the Mulberry which has been used chiefly throughout north-western India for supplying food for silkworms. For this purpose, as well as for the sake of its edible fruit, it is widely cultivated in the Punjab, Kashmir and in many other parts of the N. W. Frontier. Although often met with as apparently wild in many places, its original home is probably in N. Asia or China. Within the area of this flora the young leaves and the flowers appear in February. The fruit, which ripens during May and June is much eaten by the People, by whom many distinct forms are recognized, varying in the size of the tree and in the shape and colour of the fruiting spikes. The wood is much used in making furniture and agricultural implements, and on many of the Punjab rivers for boat-building. The leaves afford excellent fodder for sheep and goats, and the twigs are used for binding loads.—Closely allied to the preceding species is *M. ATROPURPUREA*, *Roxb. Fl. Ind. iii, 595*. It was introduced from China, and is now cultivated in various parts of India. The leaves are cordate, serrate and rarely lobed, smooth, and the long cylindric fruiting spikes are dark-purple when ripe.—*M. NIGRA*, *Linn.*; *Brandis For. Fl. 407*; *D. C. L'Orig Pl. Cult. 121*. Vern *Sháh tut*. (Black Mulberry). This tree is extensively cultivated in the Peshawar Valley, in Kashmir, also in many parts of the N. W. frontier, and beyond in Baluchistan and Afghanistan. It is also grown in Europe, in W. and Cent. Asia and in China. Its original home is not known with certainty, though it is said to be wild in Persia, whence it was introduced into Greece and Italy.—*M. SERRATA*, *Roxb. Fl. Ind. iii, 596*; *Brandis For. Fl. 409*; *Ind. Trees 612*; *Gamble Man. 635*; *Kanjilal For. Fl. 365*.—Vern. *Kimu, himu, tut, twnt*.—A large deciduous tree, cultivated in Dehra Dun, but wild on the outer ranges of the W. Himalaya up to 9,000 ft. Leaves 2-8 in. long, broadly ovate-cordate, acuminate, coarsely toothed or serrate, softly pubescent beneath. Flowers dioecious. Styles hairy, connate below. Fruit shortly cylindric, purple and sweet when ripe. The wood, which seasons well and takes a fine polish, is valued for cabinet work and is also used for making agricultural implements and tennis bats. The tree is often lopped for cattle fodder.

#### 14. *STREBLUS*, Lour.; *Fl. Brit. Ind. v, 489*.

Unarmed shrubs or trees with milky juice. *Leaves* alternate, penninerved, scabrid; *stipules* small, lanceolate. *Flowers* axillary, usually dioecious; males in peduncled heads or spikes; fem. flowers solitary or 2-4 together, stalked, bracteate. *MALE flowers*. Sepals

4, imbricate. *Stamens* 4, inflexed in bud. *Pistillode* dilated at the top. *FEM. flowers.* *Sepals* 4, imbricate, embracing the ovary. *Ovary* straight, retuse; style central, with very long arms, ovule pendulous. *Fruit* membranous, straight, subglobose, laxly covered by the persistent perianth. *Seed* globose, testa membranous, albumen none, embryo globose; one cotyledon very large, fleshy, embracing the smaller one and the ascending radicle.—Species 2, Indian and Malayan.

**S. asper**, *Lour. Fl. Cochinch. ii, 615*; *Brandis For. Fl. 410*; *Ind. Trees 615*; *F. B. I. V. 489*; *Watt E. D.*; *Kanjilal (ed. 2), 362*; *Gamble Man. 632*; *Frain Beng. Pl. 962*; *Cooke Fl. Bomb. ii, 642*. *Trophis aspera*, *Retz. (exl. syn.)*; *Roxb. Fl. Ind. iii, 761*.—*Vern. Siora* (Hind.), *dahia* and *kuchna* (Saharapur), *rusa* (Oudh).

A small usually gnarled evergreen tree attaining 20 ft. in height, but very frequently merely a shrub. Bark thick, soft, grey or greenish-white or brown, becoming rough when old. Branchlets many, rigid and often much interwoven, pubescent. *Leaves* 2-4 in. long, elliptic or rhomboid or obovate, acute or acuminate, margins more or less toothed towards the apex, rough on both surfaces with minute raised dots especially beneath; main lateral nerves 4-6 pairs; petioles about  $\frac{1}{2}$  in. long; stipules obliquely lanceolate. *Flowers* usually dioecious. **MALE FLOWERS** in shortly stalked globose heads. *Perianth* campanulate. *Sepals* hairy outside. **FEM. FLOWERS** solitary, on slender axillary usually fasciated pedicels  $\frac{1}{2}$  in. long. *Fruit* a 1-seeded subglobose berry about the size of a pea, yellow when ripe.

Common along river-banks and in hedges near villages, especially in Bundelkhand and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Jan.-March, fruiting May-July. The new leaves appear in March. **DISTRIB.** Along the base of the W. Himalaya eastwards to Bengal and through C. W. and S. India to Ceylon; extending to Burma, Siam and China. The wood of this tree resembles that of a fig. It is useful, however, by reason of its toughness and elasticity. The rough leaves are used for polishing wood and ivory. The tree is much lopped for fodder, and the fruit is eaten.

#### 15. **CUDRANIA**, *Trecul*; *Fl. Brit. Ind. v, 538*.

Shrubs, often scandent, or small trees, usually spinous. *Leaves* alternate, entire, penninerved; stipules lateral, small. *Flowers*

diœcious, bracteolate. MALE FLOWERS: *Sepals* 3-5, oblong, obtuse, adnate to 2-4 bracts, imbricate. *Stamens* 4, erect, more or less adnate to the sepals. *Pistillode* subulate or obsolete. FEM. FLOWERS: *Sepals* broader than in the male, embracing the ovary. *Ovary* straight; style terminal, simple or 2-armed; arms stout or slender; ovule pendulous. *Fruit* of ovoid compressed crustaceous achenes enclosed in the enlarged fleshy bracts and perianth and forming globose and fleshy heads. *Seed* with a membranous testa, albumen scanty, cotyledons twisted and folded, embracing the slender upcurved radicle.—Species 3 or 4, in Asia, E. Africa, Australia and New Caledonia.

**C. javanensis**, *Trecul* in *Ann. Sc. Nat. Sér. 3, VIII, 123*; *Brand. For. Fl.* 425; *Ind. Tress* 614; *F. B. I. V.*, 538; *Watt E. D.*; *Kanjilâl For. Fl.* (ed. 2), 378; *Gamble Man.* 651; *rain Beng. Pl.* 970.—Vern. *Manda*.

A large straggling or subsucculent spiny shrub or small tree; bark smooth, thin, yellowish-brown, with oblong horizontal lenticels; branchlets pubescent; spines usually curved. *Leaves* glabrous subcoriaceous, 1-4 in. long, oblong or obovate to oblanceolate, obtuse, acute or acuminate; base obtuse; lateral nerves slender, 8-10 pairs; petioles  $\frac{1}{2}$  in. or less. *Flower-heads* solitary or in pairs, pubescent; the males  $\frac{1}{4}$  in. across; the female-heads enlarging to  $\frac{1}{2}$  in. in diam. when in fruit. FEM. FLOWERS: *Perianth-lobes* 4, thickened and velvety at the tips. *Styles* 2-fid. *Fruit* an irregularly shaped compound berry somewhat resembling a small custard-apple (*Anona*), pinkish-orange and velvety when ripe.

Dehra Dun and Siwalik range and eastwards along the sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Apr.-June, and the fruit ripens in Aug. **DISTRIB**: Trop. Himalaya from the Sutlej eastwards to Sikkim; also Khasia Hills, E. Bengal, Orissa and Ceylon; extending to Burma, the Malay Peninsula, China, East Africa and Australia. The wood is used as fuel and the ripe fruit is eaten. The leaves of this shrub are often attacked by a fungus which converts them into a whitish brittle mass. This substance which is known by the name of 'Mande-ki-roti' is eaten by the villagers in Dehra Dun. This shrub bears a great resemblance to *Plecosperrum spinosum* both in habit and foliage, but in the latter the stamens are inflexed in bud, as in the tribe *Moreæ*, and the spines are and more slender and nearly straight. I have seen no specimens of *Plecosperrum* from within the area of this flora and I am inclined to believe that *Cudrania javanensis* has often been mistaken for it.



16. **ARTOCARPUS**, Forst. ; Fl. Brit. Ind. v, 539.

Evergreen trees with milky juice. *Leaves* alternate, coriaceous, often very large, entire or pinnately lobed, penninerved, stipules lateral. *Flowers* monœcious, densely crowded on globose or oblong unisexual solitary usually axillary receptacles often mixed with scale-like bracts peltate bracts. **MALE FLOWERS:** *Perianth* 2-4-lobed or partite; lobes obtuse, concave, valvate or slightly imbricate. *Stamen* 1, erect. *Pistillode* none. **FEM. flowers.** *Perianth* tubular, confluent below with the receptacle, limb minute. *Ovary* straight, style central or lateral; stigma entire, rarely 2-3-fid., ovule pendulous. *Fruit* a much enlarged fleshy oblong cylindric globose or lobed receptacle, clothed bearing on its outer surface the accrescent fleshy perianths and carpels (anthocarps), which have hard spinous or truncate or paramidal or flat apices. *Achenes* deeply sunk in the fleshy mass. *Seed* pendulous, exalbuminous, embryo straight or incurved, cotyledons fleshy; radical very short, superior.—Species about 40, in Trop. Asia, Malaya, China and the Pacific Islands.

**A. Lakoocha**, Roxb. *Fl. Ind.* iii, 524; *Royle Ill.* 337; *Brandis For. Fl.* 426; *Ind. Trees* 612; *F. B. I. V.*, 543; *Watt E. D.*; *King in Ann. R. Bot. Gard.* ii, 14, t. 13; *Kanjilal For. Fl.* (ed. 2), 379; *Gamble Man. Ind. Timb.* 655; *Prair Beng. Pl.* 971; *Cooke Fl. Bomb. ii*, 657.—Vern. *Barhal*, *dheu*.

A large deciduous tree 50—60 ft. high, with a wide-spreading head; bark thick, rough, dark-grey; young parts clothed with soft grey or tawny tomentum. *Leaves* subcoriaceous, 4-12 in. long, oblong elliptic or subobovate, entire or (or the young shoots) sometimes serrate, dark-green glabrous and shining above, softly tomentose beneath; base rounded or truncate; main lateral nerves 6-12 pairs with conspicuous reticulations between; petioles  $\frac{1}{2}$ -1 in. long, pubescent when young; stipules lanceolate, caducous. *Flowers* in axillary globose shortly stalked heads, the male and female heads from different axils; bracteoles peltate, puberulous. **MALE FLOWERS:** *Sepals* 2-3, truncate, puberulous. *Stamen* 1, its filament tapering from a broad base; anther exerted, short, broad, 2-celled. **FEM. FLOWERS:** *Fruit-clusters* 2-3 in. in diam. lobulate, smooth, velvety, yellow when ripe. *Achenes* surrounded by the fleshy perianths, the whole immersed in a common fleshy receptacle.



Dehra Dun and eastwards in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, usually in swampy ground. Often planted in gardens within the area and by roadsides. The leaves fall during the cold season and are again renewed with the flowers at the beginning of the hot season. *DISTRIB*: Trop. and Subtrop-Himalaya, ascending to 4,000 ft. in Kumaon, also eastwards to Burma and south to Travancore Ceylon and Malacca. The fruit is largely eaten by the natives of India, either cooked or raw, or as a pickle. A fibre suitable for cordage is obtained from the bark, and the wood yields a yellow dye.

A. *INTEGRIFOLIA*, Linn. f. *Suppl.* 412. A large evergreen tree with leaves 4-8 in. long, thickly coriaceous and glabrous. *Fruit* 1-2½ ft. long. The tree is largely cultivated throughout the warmer parts of India and in Burma and is quite wild in the forests of the Western Ghats. The fruit, which is known generally as the *Jack-fruit*, is much eaten as are also the seeds which are cooked. The wood, which somewhat resembles that of mahogany, has been extensively used in the manufacture of furniture.

A. *INCISA*, Linn. f. *Suppl.* 411 is the *Bread-fruit tree*, a native of the Pacific Islands. It is cultivated in some of the hottest parts of India, but it does not thrive well if planted at any great distance from the sea.

#### 17. *FICUS*, Linn.; Fl. Brit. Ind. v, 494.

Trees or shrubs, sometimes scandent or epiphytic; juice milky. *Leaves* alternate, rarely opposite, entire lobed toothed or serrate; stipules enveloping the bud, caducous. *Flowers* minute, usually monœcious, on the inner walls of a fleshy receptacle, the mouth of which is closed by imbricate bracts; florets often mixed with bracteoles, of four forms: male, female, gall and (rarely) neuter; receptacles usually androgynous, the males nearest the mouth; male fem. and gall flowers sometimes occur in the same receptacle, or males and galls may be in one set, females and neuters in another, or males and galls in one set, females only in another. *MALE flowers*: *Perianth* 2-6-fid, or-partite. *Stamens* 1 or 2, rarely 3-6, erect in bud. *NEUTERS*. *Perianth* as in males. *FEM. flowers*: *Perianth* as in the male or imperfect or obsolete. *Ovary* straight or oblique, style excentric; stigma entire or 2-armed, acute or obtuse; ovule pendulous. *GALL flowers*: *Perianth* as in female. *Ovary* containing the pupa of a hymenopterous insect; style short, often dilated upwards. *Fruit* an enlarged hollow cup-shaped closed recep-

tacle, the inner wall studded with crustaceous or fleshy achenes. *Seed* pendulous, testa membranous, albumen scanty, embryo curved, radicle ascending.—Species about 600, mostly tropical.

For full information regarding the figs of British India see Sir George King's valuable monograph published in Vol. I of the *Annals of the R. Botanic Garden, Calcutta* in 1888.

Section I. PALÆOMORPHE. Male flowers with 1 stamen and a rudimentary pistil in the same receptacle with gall flowers; female flowers in separate receptacles :—

A large epiphytic climbing shrub with thinly coriaceous leaves and small stalked globose receptacles . . . . . 1. *F. parasitica*.

Section II. UROSTIGMA. Flowers unisexual, rarely neuter. Male gall and fem. flowers in the same receptacle. Male flowers usually monandrous. Leaves alternate, entire, rarely membranous (see *F. infectoria*). Receptacles axillary or from the scars of fallen leaves, 3-bracteate at the base.—Usually trees or powerful climbers, epiphytic at least in early life :—

Petioles  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, rarely (in *F. bengalensis*) as much as 2 in., never jointed to the blade :—

Receptacles sessile :—

Leaves more or less hairy, at least when young, main lateral nerves much stronger than the secondary ones :—

Leaves obtuse at the apex, glabrous above, puberulous beneath when young; petioles up to 2 in. long; receptacles globose,  $\frac{1}{2}$  in. in diam., red and downy when ripe.—A large wide-spreading tree with many aerial roots from the main branches . . . . . 2. *F. bengalensis*.

Leaves bluntly apiculate, persistently tomentose; petioles  $\frac{1}{2}$  in. long; receptacles globose,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., grey-tomentose.—A large tree with a few aerial roots from the main branches . . . 3. *F. tomentosa*.

Leaves small, glabrous on both surfaces; nerves close, the primary lateral ones hardly stronger than the secondary; receptacles about  $\frac{1}{2}$  in. in diam., smooth, yellowish or red when ripe.—A large evergreen tree with usually a few aerial roots from the lower branches, often epiphytic . 4. *F. retusa*.

Receptacles distinctly stalked; leaves elliptic-oblong or lanceolate, bluntly acuminate at the apex and narrowed to the 3-nerved base, glabrous and shining above.—A tall evergreen tree . . 5. *F. glaberrima*.

Petioles rarely less than 2 in. (See *F. infectoria*), sometimes jointed to the blade:—

Leaves 5-7 nerved at the base:—

Leaves terminating at the apex in a slender tail about  $\frac{1}{2}$  the length of the blade; base rounded or truncate; stipules minute . . . 6. *F. religiosa*.

Leaves narrowed at the apex into a cusp about  $\frac{1}{4}$  the length of the blade; stipules  $\frac{1}{2}$ -1 in. long:—

Base of leaf truncate or slightly narrowed into the petiole, usually 5-nerved; receptacles sessile, in pairs, axillary or from leaf-scars.—A medium-sized tree . . . 7. *F. Rumphii*.

Base of leaf usually cordate, never narrowed into the petiole, always 7-nerved; receptacles usually shortly stalked, in pairs or clusters from below the leaves.—A small glabrous tree or shrub, often epiphytic . . . 8. *F. Arnotiana*.

Leaves 3-nerved at the base, the apex abruptly acuminate.—A large spreading deciduous glabrous tree, often an epiphyte in early life . . . . . 9. *F. insectoria*.

Section III. SYCIDIUM. Flowers unisexual.

Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male flowers monandrous.

Leaves alternate, polymorphous, entire toothed or variously lobed, more or less scabrid on both surfaces.—A small creeping shrub, rarely an epiphyte . . . . . 10. *F. heterophylla*.

Section IV. COVELLIA. Flowers unisexual.

Male and gall fls. in same receptacle; female fls. in separate receptacles. Male fls. monandrous; sepals 3-4. Perianth of fem. fls. gamophyllous, short or none, rarely of 4-5 sepals. Leaves alternate or opposite. Receptacles on long leafless branches from near the base of the stem or subhypogaeal, or on tubercles of the trunk, and larger branches, rarely axillary :—

Receptacles in the leaf-axils, or in fascicles from the stem and larger branches :—

Leaves ovate-oblong or subobovate, usually opposite; receptacles axillary and from tubercles on the stem.—A shrub or medium-sized tree with hollow branches . . . . . 11. *F. hispida*.

Leaves narrowly lanceolate or oblanceolate, opposite, crowded; receptacles solitary, stalked, subglobose, axillary or on short leafless branches from the old wood; young parts densely but deciduously hirsute.—A low shrub, usually found in rocky beds of streams . . . . . 12. *F. laminosa*.

Receptacles in pairs or clusters on scaly usually leafless branches from near the base of the trunk; leaves alternate, more or less scabrid or hispid-pubescent, basal lobes very unequal.—A low tree with reddish bark. . . . . 13. *F. Cunia*.

## Section V. EUCYCE. Flowers unisexual.

Male and gall flowers in one set of receptacles, fem. flowers in separate receptacles. Male fls. usually diandrous (rarely 1-andr. in *F. scandens*, or 3-andr. in *F. foveolata*). Receptacles axillary, usually small.—Scandent or erect shrubs or small trees, rarely epiphytic. Creeping or climbing shrubs :—

Leaves broadly ovate or elliptic, their length not twice the breadth; male fls. rarely 1-andr; receptacles on long stalks.—A scandent or creeping shrub, often rooting from the nodes . . . 14. *F. scandens*.

Leaves oblong, their length more than twice the breadth; male fls. rarely 3-andr. ; receptacles sessile or nearly so.—A creeper or lofty climbing shrub . . . 15. *F. foveolata*.

An erect shrub or small tree with more or less scabrid entire toothed or 3-5-lobed leaves; receptacles stalked . . . 16. *F. palmata*.

## Section VI. НЕОМОРФЕ. Flowers unisexual.

Male and gall fls. in one set of receptacles, fem. fls. in a separate set (except in *F. glomerata* which has male fem. and gall fls. in the same receptacle as in Sect. Urostigma). Male fls. 2-andr. (rarely 3-andr. in *F. Roxburghii*). Perianth inflated, 3-4-sepalous. Receptacles often very large, in clusters from tubercles on the stem and larger branches, or in *F. glomerata* with a few axillary pairs.—Trees with alternate leaves, never epiphytic :—

Leaves subcoriaceous, 5-15 in. long, broadly ovate or rounded, usually deeply cordate at the strongly 5-7-nerved base; receptacles  $2\frac{1}{2}$  in. in diam. or more, in clusters low down on the trunk . . . 17. *F. Roxburghii*."

Leaves membranous, 4-7 in. long, ovate-oblong or elliptic-lanceolate, rounded or acute at the 3-nerved base; receptacles 1-1 $\frac{1}{2}$  in. across, on scaly stalked paniced branchlets from the trunk and larger branches, rarely in the leaf-axils . . . 18. *F. glomerata*.



1. **F. parasitica**, Kæn. ex Willd. in *Mém. Acad. Berol.* 1798, 102; Brandis *For. Fl.* 420. *F. gibbosa*, Blume, var. *parasitica*, King *Sp. Ficus* 6, t. 2, fig. B; *F. B. I. V.*, 497; Watt *E. D.*; Kanjilal *For. Fl.* (ed. 2) 368; Prain *Beng. Pl.* 979; Cooke *Fl. Bomb.* ii, 644; Brandis *Ind. Trees* 599. *F. Ampelos*, Kæn.; Roxb. *Fl. Ind.* iii, 553. *F. sclerophylla*, Roxb. l. c. 546.—Vern. *Chhanchri* and *dádu-banda* (Dehra Dun).

Usually an epiphytic climber; branchlets scaberulous; bark thin, smooth, greenish-yellow. Leaves alternate, thinly coriaceous, 3-6 in. long, more or less rhomboid, obtuse acute or acuminate, minutely hispid above, scabrid and minutely hispid beneath; base acute, often unequal-sided, 3-nerved; main lateral nerves 3-7 pairs, prominent beneath and joining within the margin; petioles  $\frac{1}{2}$ - $\frac{1}{3}$  in.; stipules about as long as the petioles, ovate-lanceolate, convolute. Receptacles stalked, solitary or in pairs or fascicled, axillary and from below the leaves,  $\frac{1}{2}$ - $\frac{1}{3}$  in. across, depressed-globose or subpyriform, without basal bracts, scabrid and mammillate, yellow when ripe; peduncle as long as the receptacle, bracteate at the base. MALE FLOWERS near the mouth of the receptacles containing gall flowers. Sepals 4-6, linear, fleshy, hairy. Stamen 1, filament short, united at the base to an abortive pistil. GALL FLOWERS: Perianth as in the male. Ovary globose, smooth; style short, lateral. FERTILE FLOWERS in separate receptacles. Sepals 4, hyaline. Style elongate, lateral. Achene obliquely ovoid, slightly papillose.

Dehra Dun and eastwards along the Sub-Himalayan forest tracts; also in Bundelkhand; often found as an epiphyte on other species of *Ficus*, such as pipal and banyan. Receptacles ripen Jan.-March. DISTRIB. Throughout India and in Ceylon extending to Burma and the Andaman Islands. The rough leaves are used for polishing ivory and wood, and the root-bark is used in native medicine; the leaves are given as fodder to cattle.

2. **F. bengalensis**, Linn. *Hort. Cliff.* 471 No. 4; Brandis *For. Fl.* 412; *Ind. Trees* 600; King *Sp. Fic.* 18, t. 13; *F. B. I. V.*, 499; Watt *E. D.*; *Comm. Prod. Ind.* 536; Collett *Fl. Siml.* 459; Kanjilal *For. Fl.* (ed. 2), 369; Gamble *Man.* 638; Prain *Beng. Pl.* 979; Cooke *Fl. Bomb.* ii, 645. *F. indica*, Linn.; Roxb. *Fl. Ind.* iii, 539; Royle *Ill.* 339.—Vern. *Bor. bar*, *bargat*—The Banyan tree.

A large nearly evergreen tree sometimes up to 100 ft. in height; branches horizontally spreading and throwing down at intervals a succession of aerial roots which form supports for the indefinite elongation of



the main branches by which the circumference of this tree is extended. Young parts softly pubescent. *Leaves* coriaceous, 4-8 in. long, ovate or orbicular-ovate to elliptic, obtuse, entire, glabrescent above, glabrous or minutely pubescent beneath; base rounded or subcordate and with 3-7 nerves, the upper lateral nerves about 5-7 pairs and with conspicuous reticulate venation between; petioles stout  $\frac{1}{2}$ -2 in. long; stipules 1 in. long, coriaceous. *Receptacles* axillary, sessile in pairs, globose, about  $\frac{1}{2}$  in. in diam., puberulous and red when ripe and with  $\frac{3}{4}$  broad rounded subglabrous coriaceous basal bracts. *MALE* flowers many, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. *GALL* flowers: *Perianth* as in male. *Style* short. *FERTILE* flowers: *Perianth* shorter than in the male. *Style* elongate.

Common in the sal forests of Dehra Dun and Saharanpur and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh; also largely planted by Hindus near villages and in the vicinity of their temples. The new leaves appear March to May. *DISTRIB.*: Universally distributed throughout the plains of India and in Ceylon, either as a planted tree or appearing spontaneously as an epiphyte on tombs or old buildings, and also on the stems of various kinds of trees, often entirely enveloping their stems and eventually killing them. The common wild Date-palm is very often attacked, but owing to the endogenous growth of their stems they are not usually destroyed. The Banyan tree is believed to be quite wild in the Sub-Himalayan forests and on the lower slopes of the Deccan Hills, also in damp valleys of Chota Nagpur. The foliage affords excellent fodder for cattle and elephants.

**3. *F. tomentosa*, Roxb. ex Willd. ; Hort. Beng. 103; Fl. Ind. iii, 550; Brandis For. Fl. 414; Ind. Trees 601; King Sp. Fic. 22, t. 18; F. B. I. V., 501; Gamble Man. 640; 1 rain Beng. Pl. 980; Cooke Fl. Bomb. ii, 646.**

A large shade-giving tree, but often an epiphyte; bark smooth, greenish-white; aerial roots from the branches thin; young parts clothed with rusty-grey tomentum. *Leaves* crowded towards the ends of the branches, coriaceous, 2-5 in. long, elliptic-ovate or obovate, obtusely acuminate, entire; upper surface glabrous or nearly so, rusty-grey-tomentose beneath; base rounded or subcordate, 3-7-nerved; main lateral nerves above the basal ones about 5 pairs, prominent beneath; midrib with a broad smooth gland at the base; petiole  $\frac{3}{4}$ -1 in. long, tomentose; stipules  $\frac{1}{2}$ - $\frac{1}{2}$  in., densely woolly on the back. *Receptacles* in pairs, axillary, sessile, globose,  $\frac{1}{2}$ - $\frac{1}{2}$  in. in diam., grey-tomentose; apical scales, small, glabrous; basal bracts 3, large,

spreading, pubescent, sometimes 3-fid. when young. MALE FLOWERS few, near the mouth of the receptacle. *Sepals* 4, lanceolate. *Stamen* 1. GALL FLOWERS : *Sep.* 4, shorter than the smooth ovary ; style short. FERTILE FLOWERS : *Sep.* as in the gall flowers ; style elongate. *Achenes* tuberculate.

Forests of Bundelkhand. The fruit ripens during the hot season. DISTRIB. : Southwards from Behar and Chota Nagpur through Central W. and S. India, also in the drier tracts of Ceylon. It is very destructive to buildings if allowed to encroach as an epiphyte. The fruit is much eaten by birds.

4 *F. retusa*, Linn. Mantiss. 129 ; Brandis For. Fl. 417 ; Ind. Trees 603 ; King Sp. Ficus 50, t. 61 and t. 84 ; F. B. I. V., 511 ; Watt E. D. ; Gamble Man. 643 ; Prain Beng. Pl. 980 ; Cooke Fl. Bomb. ii, 647.—Vern Nāndan.

A large or moderate-sized evergreen glabrous tree, often epiphytic ; aerial roots few ; bark dark-grey, smooth. *Leaves* coriaceous, shortly stalked, 2-3 in. long and nearly as broad, elliptic ovate or obovate, rounded or shortly and bluntly acuminate at the apex, polished and shining ; base narrowed into the petiole, 3-nerved ; main lateral nerves 5-6 pairs above the basal ones, not more prominent than the secondary ones, reticulately veined between ; petiole  $\frac{1}{4}$ - $\frac{1}{2}$  in., stipules lanceolate,  $\frac{2}{3}$  in. *Receptacles* about  $\frac{1}{2}$  in. in diam., sessile in pairs, axillary or from the scars of fallen leaves, depressed-globose, smooth, yellow or reddish when ripe ; basal bracts 3, spreading broadly ovate, blunt, persistent. MALE FLOWERS many, scattered, sessile or shortly stalked. *Sepals* 3, subspathulate. *Stamen* 1, filament as long as the cordate apiculate anther. GALL FLOWERS sessile or nearly so. *Sepals* 3, oblong or broadly spathulate. *Style* short. FERTILE FLOWERS usually sessile. *Sepals* 3, much shorter than those of the gall flowers. *Style* short ; stigma cylindric or clavate. *Achenes* ovoid or obovoid.

Bundelkhand (Edgeworth, Duthie), often on rocks. DISTRIB. : Chota Nagpur and Behar and from Cent. W. and S. India to Ceylon ; also in the Sundribuns and in the Andaman and Malay Islands, extending to Australia. This tree, when cultivated, affords an abundance of cool shade and might be used more generally than it now is as a roadside tree and in the formation of groves. Gamble states that the wood in moderately hard and might be used for making furniture. The small figs, are much eaten by pigeons.

VAR. *nitida*, King Sp. Ficus 51, t. 62 and 84 fig. P. ; F. B. I. V., 511 ; Kanjilal For. Fl. (ed. 2), 370 ; Prain Beng. Pl. 980. *F. nitida*, Thunb.

*Fic. 14. F. Benjamina*, Willd.; Roxb. *Fl. Ind.* iii, 550.—Vern. *Kamrup*.—Leaves 2-5 in. long, ovate or rhomboid-elliptic; receptacles usually whitish.—Siwalik range at about 3,000 ft. (Kanjilal), and in the forests of N. Oudh (R. Thompson, Duthie).—Distrib.: Along the base of Himalaya from Kumaon eastwards; also in Bengal, Assam, Khasia Hills, extending to Burma and China. A very handsome evergreen tree and suitable for planting in gardens if sufficient space be allowed for the development of aerial roots from the lower branches.

**5. *F. glaberrima***, *Blume Bijdr.* 451; *King Sp. Fic.* 37, t. 43; *F. B. I. V.*, 506; *Kanjilal For. Fl.* (ed. 2), 370; *Gamble Man.* 640; *Prair Beng. Pl.* 980; *Brandis Ind. Trees* 600. *F. angustifolia*, *Roxb. Fl. Ind.* iii, 554.—Vern. *Kakri*, *durla* (fide Brandis).

A tall tree, glabrous except the branchlets and lower surface of leaves; bark light yellowish-brown, lenticellate. *Leaves* subcoriaceous, 5-8 in. long, elliptic oblong or ovate-lanceolate, bluntly acuminate, entire, glabrous and shining above, puberulous beneath; base acute, rarely rounded, 3-nerved; lateral nerves 8-10 pairs, nearly horizontal, not very prominent; petiole  $2\frac{1}{2}$  in., slender; stipules  $\frac{1}{2}$  in. linear-lanceolate, glabrous, fugacious. *Receptacles* stalked, in axillary pairs,  $\frac{1}{4}$  in. in diam., smooth and orange-coloured when ripe; basal bracts 3. **MALE FLOWERS**, a few near the mouth of the receptacle, subsessile. *Sepals* 4, lanceolate. *Stamen* 1; filament short. **GALL FLOWERS** sessile or nearly so. *Perianth* 4-fid. **FERTILE FLOWERS**: *Perianth* none. *Achenes* viscid when ripe.

Swampy ground in Dehra Dun (Duthie), and in the Sub-Himalayan tract eastwards. Receptacles ripen in Feb.-March. **DISTRIB.**: Tropical Himalaya, in shady ravines from Garhwal and Kumaon to Bhutan; also in Burma, the Andamans and the Malay Islands. The leaves and young shoots afford excellent fodder.

**6. *F. religiosa***, *Linn. Sp. Pl.* 1959; *Roxb. Fl. Ind.* iii, 547; *Royle Ill.* 337; *Brand. For. Fl.* 415; *Ind. Trees* 601; *King Sp. Fic.* 55, t. 67A; *F. B. I. V.*, 513; *Watt E. D.*; *Comm. 1 rod. Ind.* 538; *Kanjilal For. Fl.* (ed. 2), 371; *Gamble Man.* 644; *Collett Fl. Siml.* 459; *Prair Beng. Pl.* 980; *Cooke Fl. Bomb. ii*, 649.—Vern. *Pipal*, *pipli* (Hind).

A large glabrous tree usually at first epiphytic; bark grey, exfoliating in roundish irregular flakes; branches without aerial roots. *Leaves* coriaceous, shining, long-petioled, drooping, 4-7 in. long, ovate-

rotund, entire, narrowed upwards and with the apex produced into a linear-lanceolate tail  $\frac{1}{3}$  the whole length of the blade; base broad, rounded or truncate, or sometimes in young leaves cordate; 5-7 nerved; main lateral nerves about 8 pairs, with fine reticulations between; petioles 3-4 in. long, slender, terete; stipules minute, ovate, acute. *Receptacles* in pairs, axillary, sessile, smooth, depressed-globose,  $\frac{1}{2}$  in. in diam., dark-purple when ripe; basal bracts 3, broad, spreading, coriaceous. *MALE FLOWERS* few, only near the mouth of some receptacles, absent in others, sessile. *Sepals* 3, broadly ovate. *Stamen* 1, filament short. *Gall and fertile flowers* sessile or pedicelled, the gall flowers predominating, many without a perianth. *Sepals* 5, lanceolate. *Style* short, lateral, stigma rounded.

Very common within the area, but chiefly planted in villages and in the vicinity of Hindu temples. Probably wild on the Siwalik range and in the forests of the Sub-Himalayan tracts. The tree is leafless for a few weeks only, the new foliage appearing in Feb., and the receptacles ripen during April and May. *DISTRIB.*: Sub-Himalayan forests from the Punjab eastwards, also in Bengal, Orissa, the Circars and Central India. In other parts of India it has been planted or has run wild. On the Himalaya it occurs as a planted tree up to 5,000 ft. In Ceylon and Burma it was introduced by Buddhists, by whom and by all Hindus the tree is held very sacred. On this account it is often very difficult to insist upon the removal of the trees from the forests where they do very much damage as epiphytes. Buildings are also liable to serious injury by the growth of seedling plants. The trees are much lopped, chiefly by Muhammadans, in order to obtain fodder for their cattle, elephants and camels. The greyish wood is moderately hard and is sometimes used for making packing-cases or burnt for charcoal. The leaves, bark and fruit are used medicinally.

**7. F. Rumphii**, Blume *Bijdr.* 437; King *Sp. Fic.* 54, t. 67B.; *F. B. I. v.* 512; Watt *E. D.*; Kanjilal *For. Fl.* (ed. 2), 371; Gamble *Man.* 644; Collett *Fl. Siml.* 459; Prain *Beng. Pl.* 980; Cooke *Fl. Bomb.* ii, 648; Brandis *Ind. Trees* 601 and 717. *F. cordifolia*, Roxb. *Fl. Ind.* iii, 548 (not of Blume); Brandis *For. Fl.* 416, t. 48.—Vern. *Khābar gajjun*, (Hind.), *pilkhan* (Punj.), *ganiper* (Oudh), *parās-pīpal* (Merwāra).

A moderate-sized deciduous tree, usually epiphytic in early life; all parts glabrous; bark yellowish-grey, smooth. *Leaves* subcoriaceous, glabrous and shining, 3-6 in. long, broadly ovate and with an

acuminate apex forming about  $\frac{1}{3}$  of the blade; margins entire, sub-undulate; base broad, truncate, slightly narrowed towards the petiole, rarely subcordate, usually 5-nerved; main lateral nerves 3-6 pairs, prominent only in the young leaves; petiole  $2\frac{1}{2}$ - $3\frac{1}{2}$  in., flattened or channelled above; stipules  $\frac{1}{2}$ -1 in., ovate-lanceolate. *Receptacles* sessile in pairs, axillary and from the old leaf scars,  $\frac{1}{2}$  in. in diam., globular and not depressed at the apex, smooth and whitish and with dark spots when young, nearly black when ripe; basal bracts 3, small, rotund. MALE FLOWERS few, only near the mouth of the receptacle. *Sepals* 3, spatulate. *Stamen* 1, filament about as long as the anther. *Ovary* of gall flower smooth, usually obovoid. *Achene* minutely tubercled, mucilaginous; style elongate, stigma clavate.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Him. forest tracts of Rohilkhand N. Oudh and Gorakhpur, also in Bundelkhand and Merwara. Often planted in avenues, but a destructive epiphyte in forests. The young leaves, which are red, appear in March, and the receptacles ripen during May and June. **DISTRIB.**: Outer Himalayan ranges from the Chenab, ascending to 5,000 ft.; also in Assam Bengal and southwards through Central W. and S. India, extending to Burma and the Malay Peninsula and Islands. The fruit is eaten, and the foliage is much used as fodder for cattle and elephants. The soft spongy wood is pinkish-white. The tree is closely allied to *F. religiosa* which it much resembles.

**S. F. Arnottiana**, *Miq. Ann. Mus. Lugd. Bat.* iii, 287; *King Sp. Ficus* 56, t. 68 and t. 84; *F. B. I. v.*, 513; *Kanjilal For. Fl.* (ed. 2), 371; *Gamble Man.* 638; *Prain Beng. Pl.* 980; *Cooke Fl. Bomb.* ii, 649; *Brandis Ind. Trees* 602.

A small glabrous tree or a shrub, often epiphytic. *Leaves* subcoriaceous, 3-8 in. long, broadly ovate, narrowed upwards to the shortly caudate-acuminate apex, margins entire; base usually cordate, never narrowed into the petiole, 7-nerved; main lateral nerves 5-7 pairs with fine lucid reticulations between; petioles 2-6 in. long; stipules ovate-lanceolate,  $\frac{1}{2}$ -1 in. long, caducous, reddish-brown when dried. *Receptacles* mostly from the axils of fallen leaves, in pairs or clusters from tubercles, sessile or shortly stalked, depressed-globose, smooth,  $\frac{1}{2}$ - $\frac{3}{4}$  in. in diam., purple with greenish dots when ripe; basal bracts 3, brown, membranous. MALE FLOWERS few, near the mouth of the receptacles, sessile. *Sepals* 3, loose, inflated, broadly acuminate, larger than the small subsessile solitary anther. GALL AND FERTILE FLOWERS undistinguishable except by the contents of the ovary,



sessile or pedicelled. *Perianth* gamophyllous, lax, toothed at the apex, completely investing the ovary. *Style* elongate, stigma flat.

Rajputana, in the neighbourhood of Ajmer, on rocky ground (Brandis).

DISTRIB. : Outer ranges of W. Himalaya in Jaunsar Garhwal and Kumaon, up to 3,000 ft., and from Chota Nagpur through Central W. and S. India to Ceylon. The leaves resemble those of *F. Rumphii*, but they are never narrowed at the base into the petiole.

9. *F. infectoria*, Roxb. *Fl. Ind.* iii, 551 (excl. syn., Rheede) (not of Willd.) ; Brandis *For. Fl.* 414 (excl. syn.) ; *Ind. Trees* 602 ; *King Sp. Fic.* 60, t. 75 ; *F. B. I.* v, 515 ; *Watt E. D.* ; *Comm. Prod. Ind.* 538 ; *Kanjilal For. Fl.* (ed. 2), 372 ; *Gamble Man.* 645 ; *Prair Beng. Pl.* 981 ; *Cooke Fl. Bomb.* ii, 651. *F. Lacor*, Buch.-Ham. in *Trans. Linn. Soc.* XV, 150.—Vern. *Khabar*, *pākhar*, *pilkhan*.

A large spreading deciduous fast-growing glabrous tree, often epiphytic in early life and sometimes sending down a few aerial roots from the trunk or branches ; bark greenish-grey, smooth. *Leaves* membranous, 3½-5 in. long, ovate or ovate-oblong, shortly and rather abruptly acuminate ; margins entire, subundulate ; base usually rounded, slightly cordate or sometimes narrowed or acute, 3-nerved, main lateral nerves 5-7 pairs, not very prominent ; petioles 1½-2¼ in., sometimes indistinctly jointed with the blade ; stipules about ½ in., long, broadly ovate, acute, pubescent. *Receptacles* axillary, in pairs sessile, globose, ½ in. in diam., whitish flushed with red and dotted when ripe ; basal bracts 3 minute, ovate-rotund. MALE FLOWERS few, sessile near the mouth of the receptacles. *Sepals* 4 or 5. *Stamen* 1 ; anther broadly ovate filament short. *Perianth* of gall and fertile flowers as in the male. *Style* of gall flowers short ; of the fertile female flowers long, stigma elongate.

Forests of Dehra Dun and Saharanpur and eastwards along the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. It is not common anywhere wild, but is occasionally met with near villages as a planted tree. DISTRIB. : Throughout India, extending from the outer Himalayan ranges to Ceylon, Burma, Malay Peninsula and China. The wood is used chiefly for making charcoal, and the young shoots are eaten in curries. The bark yields a fairly good fibre, and the tree is much lopped to supply fodder for cattle and elephants.

VAR. 1. *Lambertiana*, *King Sp. Fic.* 63, t. 76 ; *F. B. I.* V, 516 ; *Kanjilal For. Fl.* (ed. 2) 373 ; *Prair Beng. Pl.* 981 ; *Cooke Fl. Bomb.* ii, 651. *F. Lambertiana*, Miq.—*Leaves* coriaceous ; base broad, rounded



emarginate or subcordate; receptacles stalked.—Dehra Dun and Siwalik range. **DISTRIB.**: W. C. and S. India.

**VAR. 2. Wightiana**, *King. Sp. Ficus l. c.*; *F. B. I. V.*, 516; *F. Wightiana* Wall.—Leaves smaller, often under 2½ in. long, narrowed to the base; receptacles stalked, ½ in. long, large in proportion to the size of leaves, pubescent.—Southern edge of gangetic Plain. **DISTRIB.**: W. and S. India.

**10. F. heterophylla**, *Linn. j. Suppl.* 442; *Roxb. Fl. Ind.* iii, 532; *Brandis For. Fl.* 424; *Ind. Trees* 606; *King Sp. Ficus* 75, t. 94; *F. B. I. v.*, 518; *Watt E. D.*; *Kanjilál For. Fl.* (ed. 2) 373; *Gamble Man.* 646; *Prain Beng. Pl.* 981; *Cooke Fl. Bomb.* ii, 652. *F. repens*, *Willd.*; *Roxb. Fl. Ind.* iii, 535; *Brandis For. Fl. l. c.*

A shrub, often creeping along the ground or over rocks; branchlets pubescent. Leaves alternate, polymorphous, petioled, membranous, 2-5 in. long, ovate or orbicular-ovate to lanceolate, more or less acuminate, entire or 3-many-lobed, scabrous on both surfaces; margins coarsely toothed or repand-dentate; base rounded or cordate, 3-5-nerved; main lateral nerves 4-8 pairs, arched, or in much-lobed leaves palmate; petioles ½-2½ in.; stipules 2 to each leaf, ½-¾ in. long, ovate, scarious. Receptacles stalked, solitary, axillary, globose to pyriform, more or less hispid, scabrid or warted when young, nearly smooth and orange-yellow when ripe, always with a more or less prominent mamillate partially open umbilicus; peduncle ½-1 in. long; basal bracts minute, triangular glabrous. Perianth of all the flowers 3-4-cleft. **MALE FLOWERS**: Stamen 1. **GALL FLOWERS**: Ovary ovoid, smooth; style short, lateral. **FERTILE FLOWERS**: Perianth hyaline, viscid, tubercled. Achenes subglobose; style long, lateral, stigma cylindric.

Banks of rivers and wet places in Dehra Dun, and eastwards along the Sub-Himalayan tracts to Gorakhpur, also in Bundelkhand, etc. **DISTRIB.**: Throughout the hotter parts of India and in Ceylon, extending to the Malay Peninsula and Islands.

The rough rust-coloured bark is used medicinally, and the fruit is said to be eaten. King mentions *F. scabrella* Roxb. and *F. repens* Willd. as representing the two most prevalent forms of this polymorphous shrub. In the former the leaves are shortly petioled, narrow and never lobed, and the receptacles are shortly pedicelled, globular or pyriform. The latter has broader leaves, lobed or not and with petioles over 1 in. long, and the pedicels of the pyriform receptacles

are much longer.—Examples of both of the above-mentioned forms are found within the Upper Gangetic area.

**11. *F. hispida*, Linn. j. Suppl. 442 ; Brandis For. Fl. 423 ; Ind. Trees 606 ; King Sp. Fic. 116, tt. 154 and 155 ; F. B. I. v. 522 ; Watt E. D. ; Kanjilál For. Fl. (ed. 2), 374 ; Gamble Man. 647 ; Collett Fl. Siml. 460 ; Prain Beng. Pl. 981 ; Cooke Fl. Bomb. ii, 653. *F. oppositifolia*, Willd. ; Roxb. Fl. Ind. iii, 561. *F. dæmonum*, Kæn. ; Roxb. l.c. 562 (*dæmona*).—Vern. *Kagsha*, *gobla* (Hind.), *kákxa*, *Gogsba*, *gobha* (Dehra Dun), *kat gularia* (Oudh).**

A shrub or small tree ; all parts more or less hispid-pubescent ; bark grey, peeling off in irregular flakes ; young shoots hollow. *Leaves* usually opposite, petioled, membranous, 4-12 in. long, ovate oblong or subovate, apiculate or shortly and abruptly acuminate, toothed or entire, the lower surface hispid-pubescent, the upper hispid-scabrid ; base rounded subcordate or subcuneate, 3-5-nerved ; main lateral nerves 3-5 pairs, finely reticulate between ; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in. or those of young shoots longer, densely hispid ; stipules 2 to each leaf, ovate-lanceolate, pubescent outside, about  $\frac{1}{2}$  in. long. *Receptacles*  $\frac{1}{2}$ -1 in. across, turbinate obovoid or subpyriform, hispid and often with scattered bracts along the sides, yellowish when ripe ; peduncles  $\frac{1}{2}$ -1 in. long, in axillary pairs, or in fascicles from shortened tuberculate branches from the old wood, or on elongate leafy branches issuing from the stem or larger branches and often reaching and even penetrating the soil ; basal bracts 3. **MALE FLOWERS** many, near the apex of the receptacles containing galls. *Sepals* 3, concave, hyaline. *Stamen* 1, filament short. **GALL FLOWERS** stalked. *Perianth* none. *Ovary* globose, smooth ; style short, subterminal, stigma dilated. **FERTILE FLOWERS** : *Perianth* none or obscure. *Achenes* ovoid ; style lateral ; stigma cylindric, tubular.

Fairly common in the forests of Dehra Dun and Saharanpur and eastwards to N. Oudh, also in Bundelkhand and in other parts of the area. The new foliage appears in Feb. and March. **DISTRIB.** : Outer Himalayan ranges from the Chenab eastwards, ascending to 3,500 ft. ; also in Bengal and from C. W. and S. India to Ceylon ; extending to Burma, the Andamans and from the Malay Peninsula and Islands, extending to China and Australia. This tree is reproduced partly by root-suckers. The foliage affords fodder for cattle, and the young receptacles are eaten in curries. The bark supplies a fibre suitable for making ropes.

**12. *F. laminosa*, Hardw. in As. Res. vi, 379; ex Roxb. Hort. Beng. 103; Fl. Ind. iii, 531; Madden in Journ. As. Soc. Beng. xvii, part 1, 643; Prain Beng. Pl. 982. *F. sæmocarpa*, Miq.; King Sp. Fic. 116, t. 152; F. B. I. v, 523; Kanjilâl For. Fl. (ed. 2), 374; Gamble Man. 647; Brandis Ind. Trees 606 and 718. *F. squamosa*, Roxb. Fl. Ind. iii, 531. *F. tuberculata*, Wall. (not of Roxb.); Brandis For. Fl. 424 and 577. *F. pyrrhocarpa*, Kurz.—Vern. *Chancheri* (Garhwal), *gur-timla* (Kumaon).**

A low shrub; branchlets hirsute. Leaves opposite, crowded at the ends of the branches, 3-9 in. long, linear-lanceolate or oblanceolate, entire, smooth, rarely scabrid on upper surface, smooth or scaberulous and rarely hispid beneath; base narrowed, 3-nerved; main lateral nerves 6-8 pairs; petioles  $\frac{1}{2}$ -1 in. long, pubescent; stipules in pairs  $\frac{1}{2}$ - $\frac{1}{2}$  in., ovate, acuminate, nearly glabrous, persistent. Receptacles shortly stalked, solitary in the axils, or in short leafless panicles from the old wood, subglobose,  $\frac{1}{2}$ -1 in. in diam.; base constricted, 8-10-ribbed, warted and hispid and with scattered bracts on the sides; umbilicus large; peduncles  $\frac{1}{2}$ - $\frac{1}{2}$  in., pubescent; basal bracts 3, triangular, deciduous. MALE-flowers: Stamen 1. Perianth of fem. flowers none or obscure. Ovary of gall flowers smooth; style short, lateral. Achenes rhomboid, style very long, hairy.

Dehra Dun and eastwards along the Sub-Himalayan tracts, usually by shady streams and often in the crevices of partially submerged rocks. The receptacles ripen during the cold season. DISTRIB.: Outer Himalaya from the Jumna to Bhutan, in sandy and rocky streams, also in Assam, the Khasia Hills and Burma. Closely allied to *F. hispida*, of which it may, as suggested by King, be a much modified form brought about by the peculiar conditions of its habitat. There is a coloured drawing of this shrub (plate 65) in Hardwicke's unpublished collection of drawings of Indian plants, a copy of which will be found in the botanical library at the Natural Hist. Museum. Colonel Hardwicke mentions that the villagers in Garhwal feed their cows on the branches and leaves of this shrub.

**13. *F. Cunia*, Buch.-Ham. ex Roxb. Fl. Ind. iii, 561; Brandis For. Fl. 421; Ind. Trees 606; King Sp. Fic. 101, t. 126; F. B. I. v, 523; Watt E. D.; Comm. Prod. Ind. 538; Kanjilâl For. Fl. (ed. 2), 375; Gamble Man. 648; Prain Beng. Pl. 982; Collett Fl. Siml. 460. *F. conglomerata*, Roxb. Fl. Ind. iii, 559.—Vern. *Jarhphali* (Hind.), *khain*, *kheina* (Dehra Dun), *khenna* (Bijnor), *khurhur* (Oudh).**

A low tree with reddish-brown rough bark; branchlets scabrous, *Leaves* alternate, 6-12 in. long, elliptic to oblong-lanceolate, very unequal-sided, acuminate, entire or serrate, scabrid or smooth on upper surface, more or less pubescent beneath; base semisagittate, the larger basal lobe 3-4-nerved, the smaller 1-nerved; main lateral nerves 9-14; petioles  $\frac{1}{2}$ - $\frac{3}{4}$  in., scabrid; stipules 1-1 in., linear-lanceolate, puberulous. *Receptacles*  $\frac{1}{2}$  in. in diam., globose or pyriform, in pairs or clusters on scaly usually leafless branches, hispid, reddish-brown and ribbed when ripe; peduncle short; basal bracts 3. *Male sepals* 3. *Gall and fem. sepals* about 4, lanceolate, gamophyllous. *Ovary* of galls globose, smooth; style very short, lateral. *Achenes* broadly ovoid, emarginate on one side, tubercled, viscid; style very long, lateral; stigma large, bifid.

Forests of Dehra Dun and Saharanpur, common on the Siwalik range and extending eastwards along the Sub-Himalayan tract to N. Oudh. Usually found in ravines or on the banks of streams. The receptacles ripen mostly during Aug. and Sep. **DISTRIB.** : Outer Himalayan ranges from the Chenab eastwards to Bhutan, ascending to 4,000 ft.; also in Assam, the Khasia Hills, Chittagong, Bengal and C. India. The fruit is often eaten, but is rather insipid; the bark yields a strong fibre, and the leaves are said to be used for polishing wood.

**14. F. scandens**, Roxb. *Hort. Beng.* 65; *Fl. Ind.* iii, 536; *Brandis For. Fl.* 421; *Ind. Trees* 609; *King Sp. Ficus* 129, t. 162; *F. B. I.* v, 526; *Watt E. D.*; *Kanjilâl For. Fl.* (ed. 2), 375; *Gamble Man.* 648; *Prain Beng. Pl.* 982; *Cooke Fl. Bomb.* ii, 654. *F. fruticosa*, Roxb. *Fl. Ind.* iii, 533; *F. hederacea*, Roxb. *l.c.* 538.—*Vern. Chhanchri* (Dehra Dun).

A scandent or creeping shrub, often rooting from the stem and branches. *Leaves* 2-3½ in. long, ovate or elliptic-ovate, acute or subacute, entire, rugulose and scabrid above, sub-areolar beneath; base broad, rounded, strongly 3-nerved; main lateral nerves 3 pairs; petioles  $\frac{1}{2}$ - $\frac{1}{2}$  in.; stipules  $\frac{1}{4}$  in., ovate, acuminate. *Receptacles* axillary, long-peduncled, solitary or in pairs,  $\frac{1}{2}$  in. in diam., globose, scaberulous, yellow turning to red when ripe; base sometimes constricted into a stipe; peduncle 3-5 in. long. *Sepals* of all flowers 4. *Male flowers* usually diandrous, anthers subsessile. *Ovary* of gall flowers obovoid, smooth; style subterminal, short, thick, stigma hooked. *Achenes* oblong, smooth; style lateral, long; stigma subcapitate.

Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract, usually in damp places, often climbing and trailing on rocks or

on trees. The receptacles ripen during the rainy season. **DISTRIB.:** Valleys of Outer Himalaya from the Sutlej eastwards to Bhutan; also Assam, Khasia Hills, Chittagong, Chota Nagpur, Burma, and Andaman Islands.

**15. *F. foveolata*, Wall. Cat. 4493; Brandis For. Fl. 423; Ind. Trees 608; King Sp. Ficus 133, t. 166; F. B. I. v, 528; Watt E. D.; Kanjilál For. Fl. (ed. 2), 375; Gamble Man. 648; Collett Fl. Siml. 460; Prain Beng. Pl. 982; F. pubigera, Wall.; Brandis For. Fl. 424.**

A creeper or a lofty climbing shrub. Shoots pubescent. Leaves of climbing stems membranous, 1½-6 in., ovate oblong or lanceolate, acute or acuminate, entire, glabrous above, pubescent or glabrate beneath and with prominent nerves; base rounded cordate or subcuneate, 3-nerved; main lateral nerves 3-6 pairs; petioles ½-1 in., pubescent; stipules in pairs, ½ in., villous. Receptacles axillary, sessile, usually solitary, subglobose to ovoid or obovoid, ¾-1 in. long, warted or wrinkled, downy, red or orange-coloured when ripe; basal bracts 3, ovate, acute, often reflexed; peduncle 1/16-1/8 in. **MALE FLOWERS** stalked. **Stamens** 2, rarely 3; filaments connate; anthers ovate, pointed. **Sepals** of all flowers 4. **Ovary** of gall flowers obovoid; style short, stigma dilated. **Achene** oblong-reniform, papillose; style long, subterminal.

Dehra Dun, near the Robbers' Cave. **DISTRIB.:** Outer Himalayan ranges from Chamba (Punjab) to Bhutan; also Chitral, Khasia Hills, Chittagong and Burma, extending to Hongkong, China and Japan. Collett remarks that the receptacles are rarely, if ever, produced on the creeping branches.

**16. *F. palmata*, Forsk. Fl. Ægypt.-Arab. 179; King Sp. Fic. 146, t. 185; F. B. I. v, 530; Watt E. D.; Kanjilál For. Fl. (ed. 2), 376; Gamble Man. 649; Collett Fl. Siml. 460, f. 148; Brandis Ind. Trees 607, 718. *F. caricoides* Roxb. Fl. Ind. iii, 529. *F. virgata*, Roxb. l.c. 530; Royle III. 337; Brandis For. Fl. 419.—Vern. Anjiri, bedu, khemri (Dehra Dun), kembu (Merwara).**

A bush or small tree, never an epiphyte; bark smooth, dull ashy grey; young shoots usually tomentose or pubescent. Leaves membranous 1½-5 in. long, orbicular-ovate, acute or apiculate, dentate or serrate or entire or obtusely 3-5-lobed, somewhat scabrous above, scabrid or shortly tomentose beneath; base 3-nerved; main lateral nerves 3-6 pairs; petiole 1-2 in., stipules in pairs, ovate, acute, pubes.



cent, deciduous. *Receptacles* axillary, solitary,  $\frac{1}{2}$ -1 in. in diam., subglobose or pyriform, pubescent, yellow when ripe; base constricted; bracts acute, deciduous; peduncle  $\frac{1}{2}$ -1 in. MALE FLOWERS on hairy pedicels. *Sepals* 4-5, lanceolate, hairy. GALL FLOWERS sessile or stalked. *Perianth* deeply 5-fid. *Ovary* ovoid, smooth; style very short, lateral, stigma dilated. *Perianth* of fem. flowers as in galls. *Achenes* trigonous, granular; style subterminal, long, hairy, stigma bifid.

Dehra Dui, and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Merwára. The new foliage is renewed during March and April and the figs ripen from June to Oct. *DISTRIB.*: Central and N. W. India, Outer Himalaya from Nepal westwards, ascending to 5,000 ft., and from the Suliman and Salt ranges to Chitral, Egypt and Abyssinia. This species much resembles the European fig (*F. carica*), and is generally regarded as its Indian representative. It is often cultivated in N. W. India, but chiefly on the hills where the fruit produced is of better quality. The leaves are much used as cattle fodder.

17. *F. Roxburghii*, Wall. *Cat.* 4508; *Brandis For. Fl.* 422; *Ind. Trees* 609; *King Sp. Ficus* 168, t. 211 and frontispiece; *F. B. I. v.* 534; *Watt E. D.*; *Kanjilál For. Fl.* (ed. 2), 377; *Gamble Man.* 649; *Collett Fl. Siml.* 461; *rain Beng. Pl.* 983. *F. macrophylla*, Roxb. *Fl. Ind.* iii, 556 (not of Desf.).—Vern. *Trimmál, timla*.

A low spreading tree 10-30 ft. high; trunk short, bark grey or brown, warty; branchlets few, stout, hollow. *Leaves* 5-15 in. long, broadly ovate or rounded; margins entire or toothed, mucronate, glabrous or glabrescent above, softly pubescent beneath; base usually deeply cordate, strongly 5-7-nerved; main lateral nerves 3-6 pairs, prominent on both surfaces, nervules nearly transverse; petioles 1-4 in.; stipules  $\frac{1}{2}$ -1 in., ovate-lanceolate, pubescent. *Receptacles* 8-12-ribbed, turbinate, in clusters on short leafless branchlets from low down on the trunk,  $2\frac{1}{2}$  in. across or larger, pubescent or glabrous, russet-brown or purplish and spotted when ripe; umbilicus large, triangular; peduncle pubescent,  $\frac{3}{4}$ -1 $\frac{1}{2}$  in. long. MALE flowers: *Sepals* large, inflated, broadly imbricate. *Stamens* 2, rarely 3; filaments long, stout. GALL flowers: *Perianth* 2-3-lobed. *Style* short, subterminal, stigma dilated. FEM. flowers subsessile or stalked. *Perianth* as in gall flowers. *Achenes* granulate, viscid; style long, lateral, curved, hairy, stigma cylindric.



Dehra Dun and Siwalik range and eastwards along the Sub-Himalayan tract. The receptacles ripen April to June. **DISTRIB.:** Outer Himalayan ranges from the Indus to Bhutan, up to 5,000 ft., rarer towards the west, also Assam, Khasia Hills, Chittagong, Chota Nagpur and Orissa, extending to Burma, China and Japan. The bark yields a coarse fibre, and the foliage is regarded as a good fodder for elephants and camels. The fruit is much eaten either raw or cooked in curries. For information regarding the development and fertilization of the flowers see D. D. Cunningham in Appendix to Vol. I of Ann. R. Bot. Gard. Calc.

**13. F. glomerata**, Roxb. *Cor. Pl.* ii, 13, t. 123; *Fl. Ind.* iii, 558; *Royle Ill.* 337; *Brandis For. Fl.* 422, t. 49; *Ind. Trees* 609; *King Sp. Ficus* 173, t. 218A; *F. B. I. v.* 535; *Watt E. D.*; *Comm. Prod. Ind.* 538; *Kanjilâl For. Fl.* (ed. 2), 378; *Gamble Man.* 650; *Prair Benq. Pl.* 983; *Cooke Fl. Bomb.* ii, 654. *F. Goolerea*, Roxb. *Fl. Ind.* iii, 538.—Vern. *Gular* (Hind.), *umri* (Merwara).

A tree, up to 60 ft. high; bark smooth, reddish-brown; young shoots glabrous pubescent or scaberulous. *Leaves* membranous, 4-7 in. long, ovate-oblong or elliptic-lanceolate, subacute, entire, glabrous or upper surfaces when mature, usually somewhat pubescent beneath; base rounded or acute, 3-nerved; main lateral nerves 4-6 pairs; petioles  $\frac{1}{2}$ -1 $\frac{1}{2}$  in., glabrous; stipules  $\frac{1}{2}$ -1 in. long; ovate-lanceolate, scarious, pubescent. *Receptacles* in clusters on short thick scaly leafless paniced branchlets from the trunk and larger branches, rarely with a few axillary ones, subglobose pyriform or turbinate, smooth or downy, 1-2 in. across, reddish or orange-coloured when ripe; umbilicus depressed; base much contracted and with 3 ovate-triangular bracts. The male, female and gall flowers are all found together in the same receptacle. **MALE FLOWERS** near the mouth of the receptacle, sessile. *Sepals* 3-4, membranous, inflated, enveloping the 2 anthers. *Filaments* connate. **GALL FLOWERS** stalked. *Perianth* gamophyllous, irregularly toothed. *Style* lateral, elongate, stigma clavate. **FERTILE FLOWERS** nearly sessile, forming a layer near the walls of the receptacle. *Perianth* gamophyllous, with 4 or 5 long lanceolate teeth, enveloping the small tuberculate achene. *Style* subterminal, stigma clavate.

A common tree within the area and also largely planted in villages. It is leafless during the rainy season (about Aug.), and the figs ripen between April and July. **DISTRIB.:** Throughout the greater part of India from the Outer Himalayan ranges and south to S. India and Ceylon, its western limit being Rájputana and the Salt Range of

the Punjab. The fruit is much eaten by the natives, both raw and cooked, and it constitutes a valuable food supply during times of famine. The viscid milky juice is made into birdlime. The foliage is much lopped for supplying fodder for cattle and elephants, and the leaves, bark and fruit are used in native medicine. Kanjilâl mentions that the wood of this tree is one of the few kinds prescribed in Hindu scriptures for sacrificial fires. It is said to last well under water.

The following non-indigenous species of *Ficus* are occasionally met with in gardens within the area of this flora :—

*F. BENJAMINA*, *L.* var. *COMOSA* Kurz ; *F. B. I. v.* 508 ; *Prain Beng. Pl.* 979 ; *Brandis Ind. Trees* 604 ; *Gamble Man.* 641. *F. comosa*, *Roxb. Fl. Ind. iii.* 552.—A very ornamental tree with the habit of *F. retusa*, and producing from its lower branches similar aerial roots. The receptacles are yellow and much larger than those of the type. It is wild in Chota Nagpur and in the Circars and in the valleys of the E. Himalaya ; also in Assam, Chittagong and throughout Burma.

*F. ELASTICA*, *Roxb. ; Fl. Ind. iii.* 541 ; *Brand. For. Fl.* 417 ; *Ind. Trees* 603 ; *F. B. I. v.* 508 ; *Kanjilâl For. Fl. (ed. 2),* 369 ; *Cooke Fl. Bomb. ii.* 655 ; *Gamble Man.* 641.—The well-known india-rubber, or caoutchouc-tree, a native of the Eastern Himalaya up to 3,000 ft. ; also in Assam, the Khasia Hills and extending to Upper Burma. It is grown in many parts of India as an ornamental tree in gardens, as well as for avenues. For full particulars regarding its cultivation for rubber see Watt's *Comm. Prod. Ind.*, p. 651.

*F. TSIELA*, *Roxb. Fl. Ind. iii.* 549 ; *Brandis For. Fl.* 415 ; *Ind. Trees* 603 ; *King Sp. Ficus* 59, tt. 73, 74 ; *F. B. I. v.* 15 ; *Gamble Man.* 645 ; *Cooke Fl. Bomb. ii.* 650.—A large spreading glabrous tree, without aerial roots ; allied to *F. infectoria*. It is found in the Ajmer district of Rájputana as a planted tree, but it is truly wild in the drier parts of S. India and in Ceylon. The smooth greenish-white bark is said to yield a good fibre.

*F. CARICA*, *Linn. ; Brandis For. Fl.* 418 ; *Ind. Trees* 607 ; *DC. L'Orig. Pl. Cult.* 235 ; *Watt Comm. Prod. Ind.* 537.—Vern. *Anjir*, *kimri*—Edible fig of Europe. The European fig is extensively cultivated in the plains of N. India and up to 5,000 ft. on the Outer Himalayan ranges. It is also largely grown in Kashmir, Baluchistan and Afghanistan and many excellent varieties may be found in those countries. It is said to be truly indigenous in Syria and Palestine. In S. Europe it has become naturalized, and is quite hardy in England.

*BROUSSONETIA PAPYRIFERA*, Vent.; *Royle Ill.* 340; *Brandis For. Fl.* 410; *Ind. Trees* 613; *F. B. I. v.* 490; *Kanjilâl For. Fl. (ed. 2)* 366; *Gamble Man.* 633; *Prain Beng. Pl.* 967; *Watt in Comm. Prod. Ind.*—Paper Mulberry.—A small tree belonging to the mulberry tribe. Branchlets tomentose. *Leaves* membranous, 3-nerved, 3-8 in. long, obliquely ovate or oblong, acuminate, lobed (when young) and dentate, scabrid above, pubescent beneath; petioles 2-3 in. long. *Flowers* dioecious. *MALE* spikes 2-3 in. long, cylindrical, stalked pubescent. *FEM.* flowers in compact long-stalked heads. *Fruit* fleshy, red shining.—Wild on the hills of Upper Burma and in Martaban; extending to Siam, China, Japan and the Pacific Islands. The stems yield a fine fibre which is used for making paper in Japan, and in the South Sea Islands the natives prepare from it a cloth called *tapa* or *kapa*. Experiments undertaken within the area of this flora, both in Dehra Dun and at Saharanpur, clearly show that the climate of N. India is quite suitable for its cultivation. It has been suggested that it might possibly pay to grow this tree on a large scale in N. India if a paper factory were situated near enough, and if a constant supply of the fibre material of this and other fibre-yielding plants suitable for making paper were available.

## CI. CASUARINACEÆ.

*CASUARINA*, Forst. A single genus, containing 23 species, mostly Australian and a few in New Caledonia, one only extending to India. Several other species are in cultivation in India, especially on the Nilgiri Hills.

*C. EQUSETIFOLIA*, Forst.; *F. B. I. v.* 598; *Brandis For. Fl.* 435; *Ind. Trees* 620; *Gamble Man.* 665; *Prain Beng. Pl.* 985; *Cooke Fl. Bomb. ii.* 660. *C. muricata*, Roxb. *Fl. Ind. iii.* 519; *Royle Ill.* 346.—A tall handsome straight-stemmed dioecious leafless tree. Branches terminating in long slender drooping deciduous 6-8 jointed branchlets, which perform the functions of leaves. The ribs of each joint terminate upwards in the teeth or scales\* of a membranous sheath alternating with the ribs of the next joint above. Male flowers monandrous, in terminal cylindric spikes, and the females are arranged in small cone-like clusters which become woody

\* Similar to the scale-leaves of *Equisetum*.

when ripe. This tree is indigenous on the sandy sea-coasts of Chittagong and Burma, also in the islands of the Indian Archipelago and in N. Australia, where it is known as the "Beefwood tree." It is cultivated largely all over India, and thrives well as far north as Saharanpur and Ambála. The wood is of a reddish colour and resembles in texture that of *Cedrela Toona*, but is very hard, and difficult to work. It is chiefly used for fuel. The tree is very useful in the reclamation of land near the sea and is much valued in the Madras and Bombay Presidencies for planting on sand-dunes along the coasts of Coromandel and N. Kanara.

## CII. CUPULIFERÆ.

Trees or shrubs. *Leaves* simple, alternate, <sup>penni</sup> penni nerved, serrate or entire, rarely lobed; stipules free, usually <sup>caducous</sup> caducous. *Flowers* minute, monœcious, males in erect or pendulous catkins or spikes, rarely capitate; females in spikes or heads or solitary, bracts sometimes forming an involucre. *MALE flowers*: *Sepals* 1-5, free connate or obsolete. *Stamens* 2-20, on a hairy receptacle or adnate to the base of the sepals. *FEM. flowers*: *Sepals* connate in a perianth adnate to the ovary or none, limb minute. *Ovary* 2-3-, rarely 4-6-celled, styles or style-arms as many as the cells; ovules 1 or 2, collateral, pendulous, anatropous. *Fruit* a nut included within or in the axil of often greatly enlarged, sometimes involucrate bracts. *Seed* usually solitary by abortion, pendulous, albumen none; cotyledons plano-convex, sometimes rugose or ruminate, radicle superior.—Species about 400, chiefly in N. temperate regions.

### QUERCUS, Linn. ; Fl. Brit. Ind. v, 600.

Trees or shrubs, deciduous or evergreen. *Leaves* alternate, simple, penni nerved, stipules fugacious. *Flowers* small, monœcious; males in pendulous or erect spikes, bracts small; females in erect spikes, rarely androgynous, bracts involucrate. *MALE flowers*: *Perianth* campanulate, 4-7-lobed or -partite. *Stamens* 6-12, filaments slender; anthers erect, ovate, the cells contiguous. *Pistillode* hairy or none. *FEM. flowers*: *Perianth* adnate to the ovary and enclosed within imbricate bracts; limb very minute, lobed or



toothed. *Staminodes* minute or none. *Ovary* after fecundation more or less perfectly 3-celled, rarely 4-5-celled; styles 3-5, short, ovules 2 in each cell. *Fruit*, an ovoid globose or depressed 1-celled nut, seated on or enclosed in and attached by its broad base or by its whole surface to an involucre of imbricating hard bracts. *Seeds* 1-2, testa membranous, cotyledons plano-convex, thick, fleshy, smooth, grooved, lobed or ruminant, radicle minute.—Species about 300, in temperate and tropical regions. There are no wild oaks in S. India or Ceylon, and the genus is absent from S. America, Trop. and S. Africa and Australia.

*Q. incana*, Roxb. Hort. Beng. 104; Fl. Ind. ii, 642; Brandis For. Fl. 482; Ind. Trees 626; F. B. I. v, 603; Walt E. D.; Comm. Prod. Ind. 911; Kuntz in Ann. Bot. Gard. ii, 26, t. 20; Kanjilâl For. Fl. (ed. 2), 402; Gamble Man. 675; Collett Fl. Siml. 475.—Vern. Bân, bânj (N. W. Him.).—White or grey oak.

A medium-sized or large evergreen tree up to 80 ft. high; young shoots hoary or woolly. *Leaves* coriaceous, pinkish when young and woolly all over, 3-6 in. long, oblong or ovate-lanceolate, acuminate, mucronate-serrate, glabrous above, densely white-tomentose beneath; main lateral nerves 14-20 pairs, straight, parallel, prominent beneath. *MALE* flowers softly pubescent, in slender drooping catkins 2-4 in. long. *Perianth* 4-5-lobed. *Anthers* glabrous. *FEM.* flowers axillary, sessile, usually in clusters of 2-5. *Styles* linear-clavate, spreading. *Cup* axillary, solitary or clustered,  $\frac{1}{2}$  in. in diam., embracing half the conico-ovoid nut when ripe. *Nut*  $\frac{1}{4}$ —1 in. long, white-tomentose when young, at length glabrous and brown.

Dehra Dun, in the Mothronwala swamp, at an elevation of 1,900 ft. A few specimens of this tree planted many years ago on a shady spot in the Government Garden at Saharanpur managed to survive the tropical heat during several summers. *DISTRIB.*: W. Himalaya from the Indus to Nepal at 2-8,000 ft. It also occurs in the neighbourhood of Chitral in the N. W. Frontier Province, as well as on the Punjab Salt range and on the Shan hills of Upper Burma. The tree is very common on the outer ranges of the W. Himalaya and is often gregarious. It is frequently associated with *Rhododendron arboreum*, *Pieris ovalifolia* (ayâr) and occasionally with deodar. The wood is used as fuel and for making charcoal. The bark contains a large percentage of tannin, and the leaves are much used as cattle fodder.

*Q. SERRATA*, *Thunb.* A handsome deciduous oak of the Central and E. Himalaya. It has been planted in Dehra Dun where it thrives. The wood closely resembles that of the English oak, and is much valued. This tree is found also in China and Japan.

*CASTANEA VULGARIS*, *Lamk.* ; *Brandis For. Fl.* 491 ; *Ind. Trees* 635 ; *DC. L'Orig. Pl. Cult.* 283 ; *Gamble Man.* 667. *C. vesca*, *Gærtn.* *C. sativa*, *Mill.*—Sweet chestnut. Many attempts have been made to introduce this tree for cultivation on the outer ranges of the Himalaya. Gamble remarks that the most successful results have been obtained at comparatively low elevations (3-5,000 ft.) with a northern aspect, and where the rainfall is not excessive. Also a good sandy soil rather than a clayey one appears to suit the trees best. The plantations which were started many years ago in Dehra Dun have been fairly successful, but the nuts are smaller than those yielded by the European tree and are inferior in quality. It resembles more nearly the fruit of the tree as grown in Japan and N. America.

### III. SALICACEÆ.

Trees or shrubs. *Leaves* deciduous, alternate, 3-5-nerved at the base, stipulate. *Flowers* in catkins, one within each bract, diœcious, rarely monœcious or androgynous, bracteoles none. *Perianth* none. *Disk* of one or more scales or glands, or cupular. *MALE* flowers: *Stamens* 2 or more, filaments free or connate; anthers ovate-oblong, bursting longitudinally. *FEM.* flowers: *Ovary* sessile or stipitate, 1-celled, style short or none; stigmas short, notched or lobed; ovules few or many, on 2-4 subbasal or parietal placentas, erect, anatropous. *Fruit*, an ovoid or lanceolate 2-4-valved capsule. *Seeds* few or many, funicle with a pencil of long silky deciduous hairs, albumen none, cotyledons plano-convex; radicle short, inferior.—Species about 180, chiefly in N. temperate regions.

*SALIX*, *Linn.* ; *Fl. Brit. Ind.* v, 626.

Trees or shrubs, sometimes small and prostrate. *Leaves* usually narrow or small, entire or serrulate, penni nerved; stipules various. *Flowers* small, diœcious, sessile, in erect, usually dense catkins; bracts small, entire or rarely toothed. *Perianth* none. *Disk* of 2 scales, anterior or posterior, or of one posterior scale,



fleshy or glandular. MALE flowers: *Stamens* 2, rarely 3 or more; filaments filiform, free, rarely connate; anthers usually small. FEM. flowers: *Ovary* sessile or stipitate; placentas 2; ovules usually 4-8; style usually short, with 2 short retuse or 2-fid arms. *Fruit*, a 2-valved capsule. *Seeds* with penicillate funicle; albumen none; cotyledons plano-convex; radicle inferior.—Species about 160, mostly in N. Temp. regions.

*Stamens* 4 or more; flowers appearing after the leaves:—

Leaves lanceolate, serrulate, capsule ovoid,  
on long pedicels . . . . . 1. *S. tetrasperma*.

Leaves linear-lanceolate, entire; capsule  
ovoid-lanceolate, on short pedicels . . . . . 2. *S. acmophylla*.

1. *S. tetrasperma*, Roxb. *Cor. Pl. i*, 66, t. 97; *Fl. Ind. iii*, 573; *Royle Ill. 343*; *Brandis For. Fl. 462*, t. 58; *Ind. Trees 636*; *F. B. I. v*, 626; *Watt E. D.*; *Kanjilâl For. Fl. (ed. 2)*, 387; *Gamble Man. 685*; *Collett Fl. Siml. 478*; *Prair Beng. Pl. 989*; *Cooke Fl. Bomb. ii*, 661.—*Vern. Bed. bent, baishi* (Hind.), *laila, bains* (N. W. Ind.), *bilsa, bhiusa* (Oudh), *jalmâla* (Dehra Dun), *besa* (Bundelkhand), *bhynsh* (Bijnor).

A medium-sized tree or shrub. *Bark* rough with deep vertical furrows. Young parts silky, the branchlets and underside of leaves sometimes pubescent. *Leaves* 3-6 in. long, lanceolate or ovate-lanceolate, glaucous beneath, usually regularly serrulate; petioles  $\frac{1}{2}$ -1 in. long. *Male catkins* 2-4 in. long. *Flowers* scented. *Stamens* 5-10. *Fem. catkins* 3-5 in. long. *Capsules* glabrous, long-stalked, style short, with two spreading, usually entire stigmas. *Seeds* 4-6.

Abundant within the area, especially on the banks of streams and on moist swampy ground. It is common in Dehra Dun and on the Siwalik range, and along the Sub-Himalayan tracts of Rohilkhand and N. Oudh to the Gorakhpur district, and it occurs also in Bundelkhand and in the Ajmer district. The new foliage appears during Feb. and March, and it flowers from Feb. to April and sometimes again in the autumn. *DISTRIB.*: More or less throughout tropical and subtropical India from the Punjab eastwards to Manipur and Burma, ascending the Himalayan valleys up to 6,000 ft., and southwards to Travancore and to the Malay Peninsula and Java. It is not found in Ceylon nor in the more arid tracts of W. and Central India. The soft reddish porous wood is used for making gunpowder

charcoal. The branches are lopped for fodder, and the twigs are much used by basket-makers. Many varieties of this polymorphous plant are mentioned in the Fl. Brit. Ind., the majority of which must be regarded merely as representing geographical forms. Thus Sir Joseph Hooker distinguishes the prevalent N. W. Indian form as compared with the southern and eastern ones. In the former the leaves are usually longer and narrower and become pale-green or yellowish when dry, and the nerves are more oblique. The pale-coloured capsules also are larger and on shorter stalks. In the southern and eastern forms the leaves are usually shorter and broader and with the upper surface shining, and they are dark-brown when dry; the nerves too are nearly horizontal, and the capsules are smaller and dark-coloured and usually with longer and more slender stalks. From my own observations I am inclined to believe that the southern form extends as far north as Mt. Abu and Bundelkhand.

**2. *S. acmophylla*, Boiss. *Diagn. vii*, 98; *Fl. Or. iv*, 1183; Brandis *For. Fl.; Ind. Trees* 636; *F. B. I. v*, 628; *Watt. E. D.*; *Kanjilál For. Fl. (ed. 2)*, 388; *Gamble Man.* 686.—Vern. *Jalmála*.**

A moderate-sized glabrous tree, with the trunk up to 7 ft. in girth; branches lax, forming a rounded crown; branchlets often pendulous. *Leaves* 2-5 in. long, linear-lanceolate, the upper ones caudate-acuminate, entire or serrulate, glaucous beneath. *Catkins* short, shortly stalked; bracts scale-like, ovate or oblong, concave villous. *Male catkins* 1-2 in. long, cylindric, dense-flowered. *Stamens* 4-6. *Fem. catkins* nodding, 1 in. long, bracts deciduous. *Capsules* ovoid-oblong, on short stalks; stigmas sessile, short, entire.

Dehra Dun and Saharanpur forests, Siwalik range and Sub-Himalayan tracts from the Ganges westwards, often cultivated. Flowers after the leaves appear. *Distrib.*: Himalayan valleys up to 6,000 ft. and westwards to Afghanistan and Baluchistan where it is much cultivated for cattle fodder. It is also grown to some extent in gardens as an ornamental tree. Brandis regarded this tree as intermediate between *S. tetrasperma* and the W. African *S. Sufuf*. A local form found in Dehra Dun with reddish fragile branches, gland-serrulate leaves, and male flowers always with 6 stamens may prove to be a distinct species.

***S. BABYLONICA*, Linn.; Roxb. *Fl. Ind. iii*, 754; Brandis *For. Fl.* 465, *t.* 59; *Ind. Trees* 637; *F. B. I. v*, 629; *Gamble Man.* 688.—Weeping willow.—Largely cultivated in the plains of N. W. India in gardens and on canal banks, also on the Himalaya up to 9,000 ft. It is culti-**

vated in Afghanistan and in S. and Cent. Europe and in most subtropical countries. It may possibly be wild in Persia and Cent. Asia and in China.

#### CIV. CERATOPHYLLACEÆ.

Slender, fragile, branched, submerged herbs. *Leaves* whorled, dichotomously cleft into filiform minutely toothed lobes; stipules none. *Flowers* minute, monœcious, axillary, sessile. MALE-flowers solitary. *Perianth* (or involucre) of 6-12 narrow subvalvate 2-fid segments. *Stamens* 10-30; filaments very short; anthers erect, extrorse, debiscing longitudinally, connective truncate or 2-toothed at the apex. FEM. flowers: *Perianth* of the male. *Ovary* sessile, ovoid, 1-celled; ovule solitary, pendulous, orthotropous; style subulate, stigmatic on one side. *Fruit*, a small coriaceous ovoid or ellipsoid subcompressed nutlet, terminating in a long subulate style with a spur projecting from the base on either side. *Seed* pendulous; testa membranous; albumen none; embryo straight; cotyledons thick; radicle short, inferior; plumule many-leaved.—A single genus, and one variable species distributed in all temperate and tropical countries.

CERATOPHYLLUM, *Linn.*; *Fl. Brit. Ind.* v, 639. Characters of the family.

*C. demersum*, *Linn. Sp. Pl.* 992; *F. B. I.* v, 639; *Prair. Beng. Pl.* 990; *Cooke Fl. Bomb.* ii, 663. *C. verticillatum*, *Roxb. Fl. Ind.* iii, 624.—Vern. *Jhangi* (Beng.).

Whole plant 8 in.-3 ft. long, forming a much-branched tangle of slender branches and leaves which collapse in a tassel when taken out of the water. *Leaves* 1 in. long; segments spreading in water, variable in thickness and amount of toothings. MALE flowers solitary, in separate axils from the female but on the same plant. *Anthers* large, white. FEM. flowers. *Perianth* (or involucre) as in the male, often with an entire acute (not 2-fid) apex.

Rohilkhand near Moradabad (T. Thomson); Kheri in N. Oudh and Gorakhpur (Duthie); Saugor (Jerdon), and probably overlooked in many other localities. *DISTRIB.*: Bengal, ponds and ditches in all the provinces, and no doubt generally distributed throughout the greater part of India.